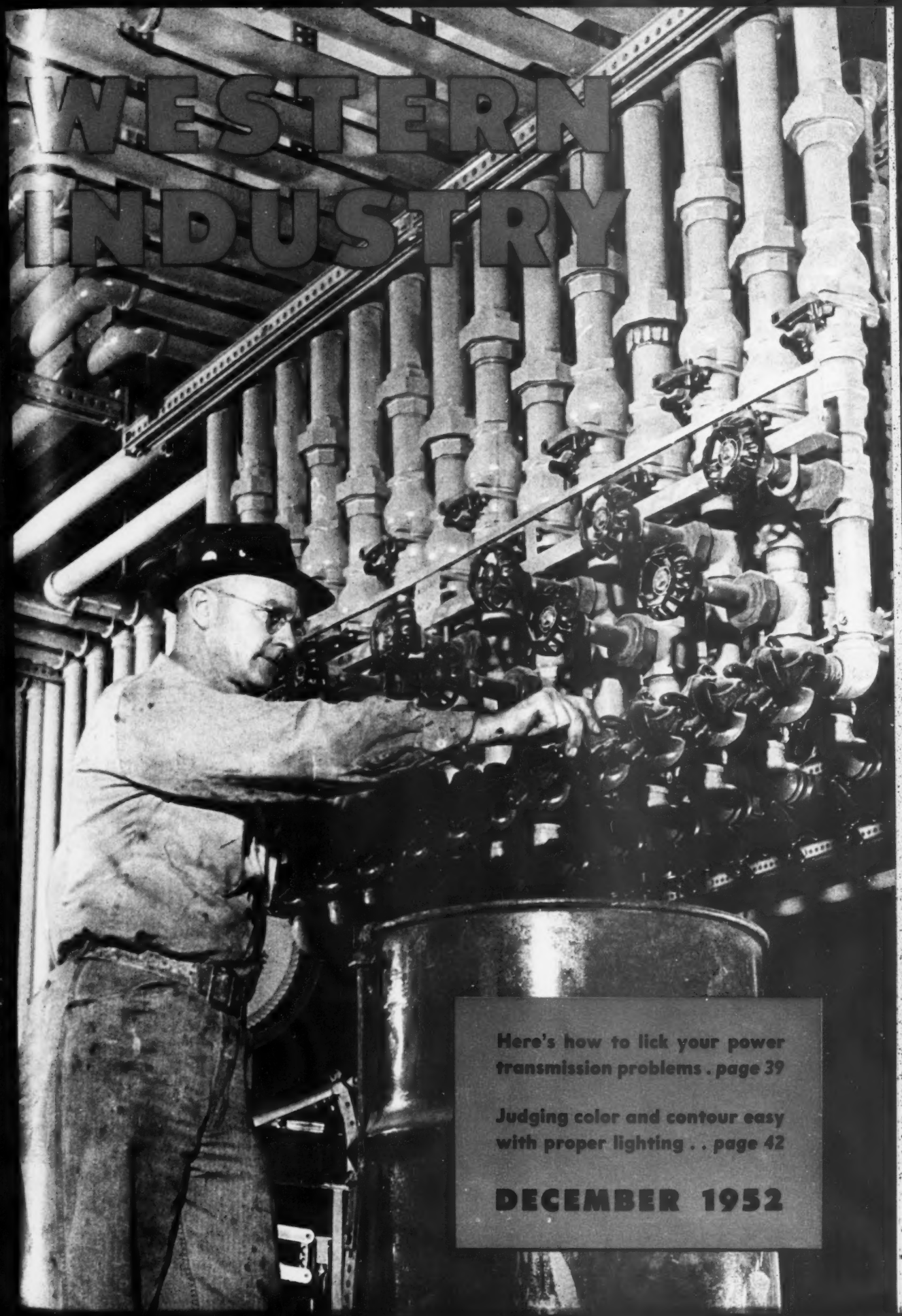
WESTERN INDUSTRY



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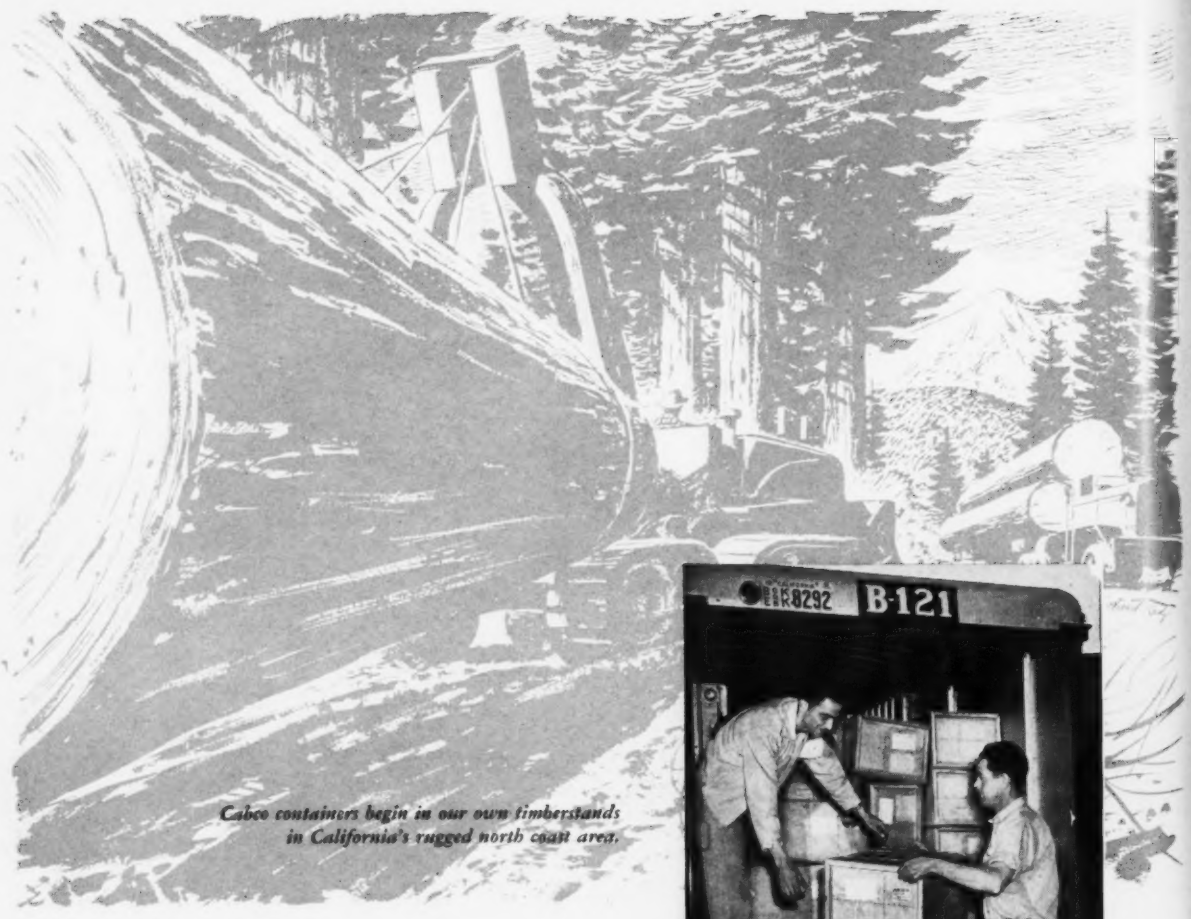
DECEMBER 1952



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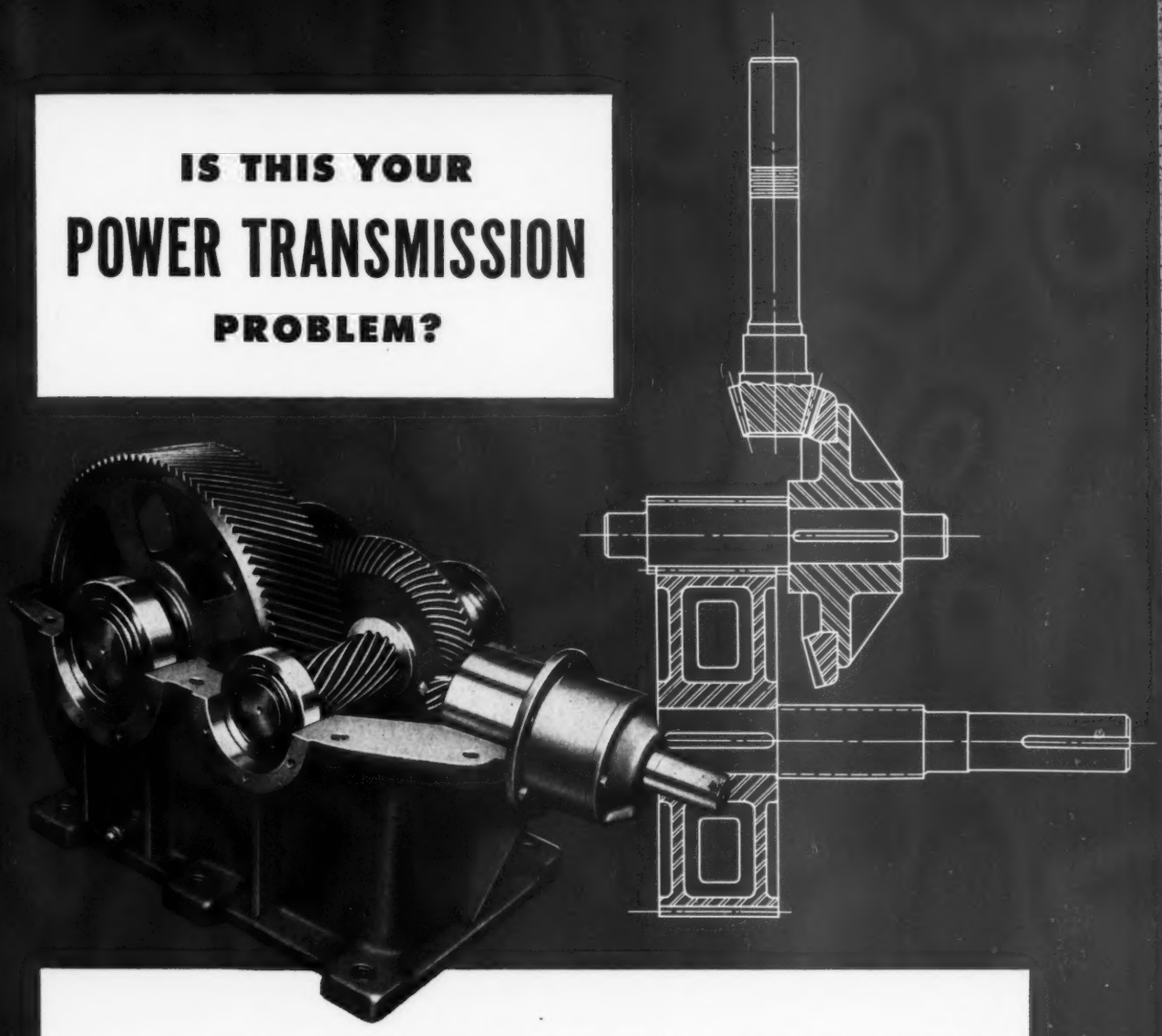

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WESTERN INDUSTRY

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FRONT COVER

In the control laboratory of W. P. Fuller & Co. Industrial Products Factory, at South San Francisco, Elmer Betts, foreman, prepares to draw thinner for a batch in the Mixing and Grinding Department. This branch of Fuller Co. supplies many industrial products for Western manufacturers.

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Correspondents
O. N. Malmquist
c/o Salt Lake Tribune
Salt Lake City 1, Utah

L. E. Thorpe
209 Seneca Street
Seattle 1, Wash.

★

District Offices

NEW YORK OFFICE
Richard J. Murphy, Eastern Manager
107-51 131st Street
Richmond Hill 19, New York
Telephone Jamaica 9-2651

CLEVELAND OFFICE
Clifford E. Beavan, District Manager
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Telephone Brookfield 532

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609 Mission St., San Francisco 5, Calif.
Telephone YUkon 2-4343

LOS ANGELES OFFICE
Jerome E. Badgley, District Manager
128 So. Mansfield Ave., Los Angeles 36
Telephone WEbster 8-8512

PACIFIC NORTHWEST
Arthur J. Urbain, District Manager
609 Mission St., San Francisco 5, Calif.
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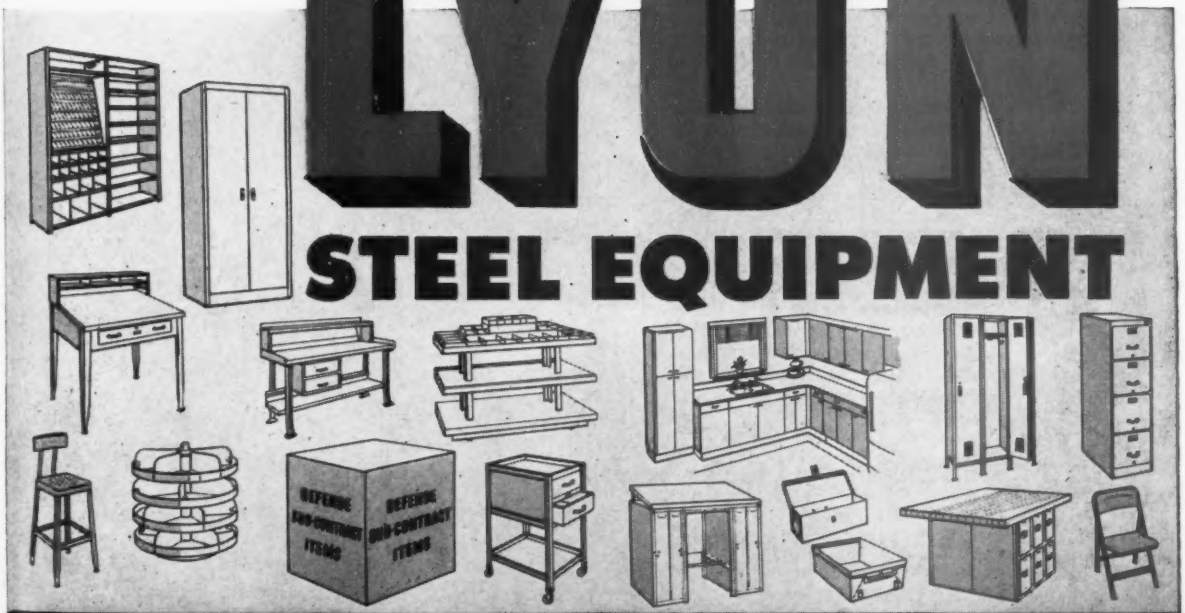

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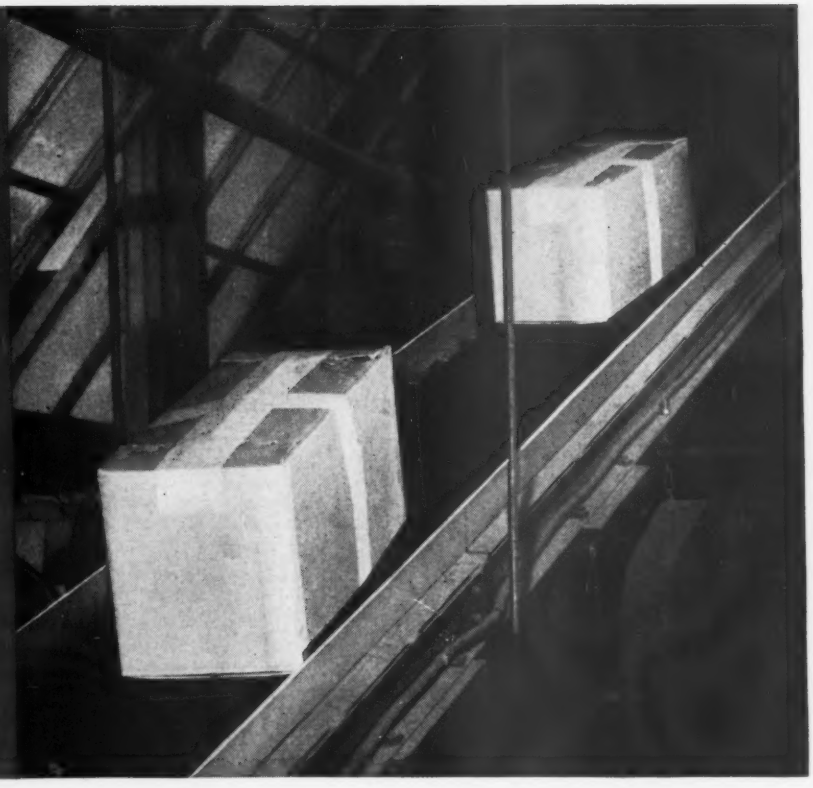

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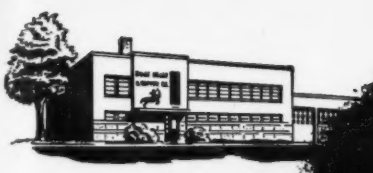

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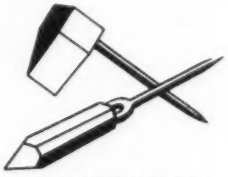

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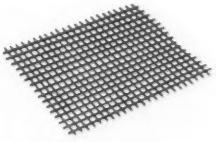

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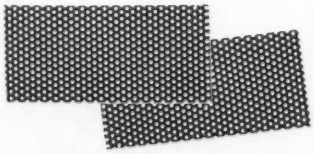

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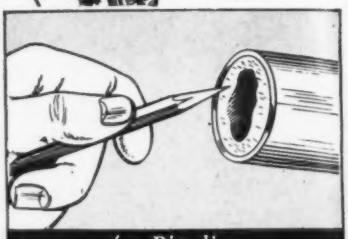

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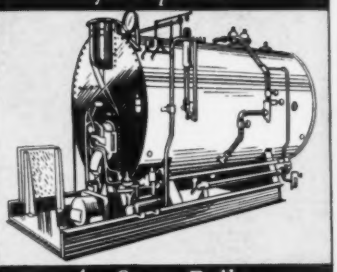

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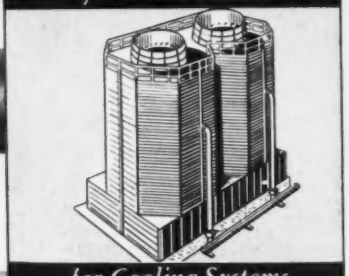

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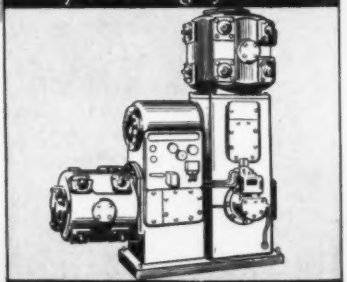

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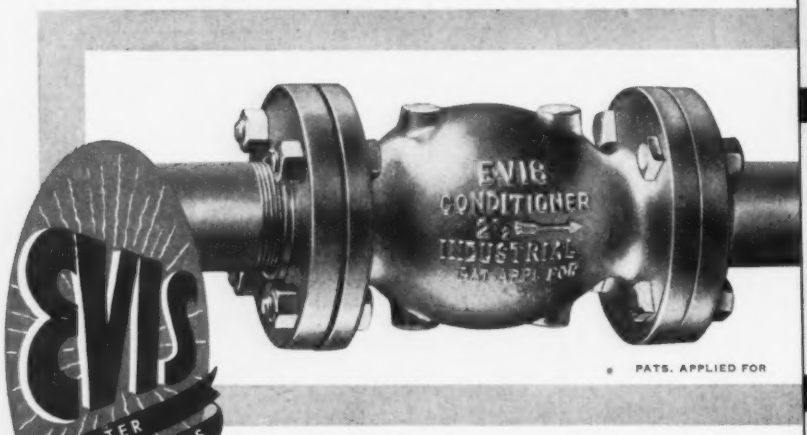

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ACME STEEL

ACME STEEL COMPANY

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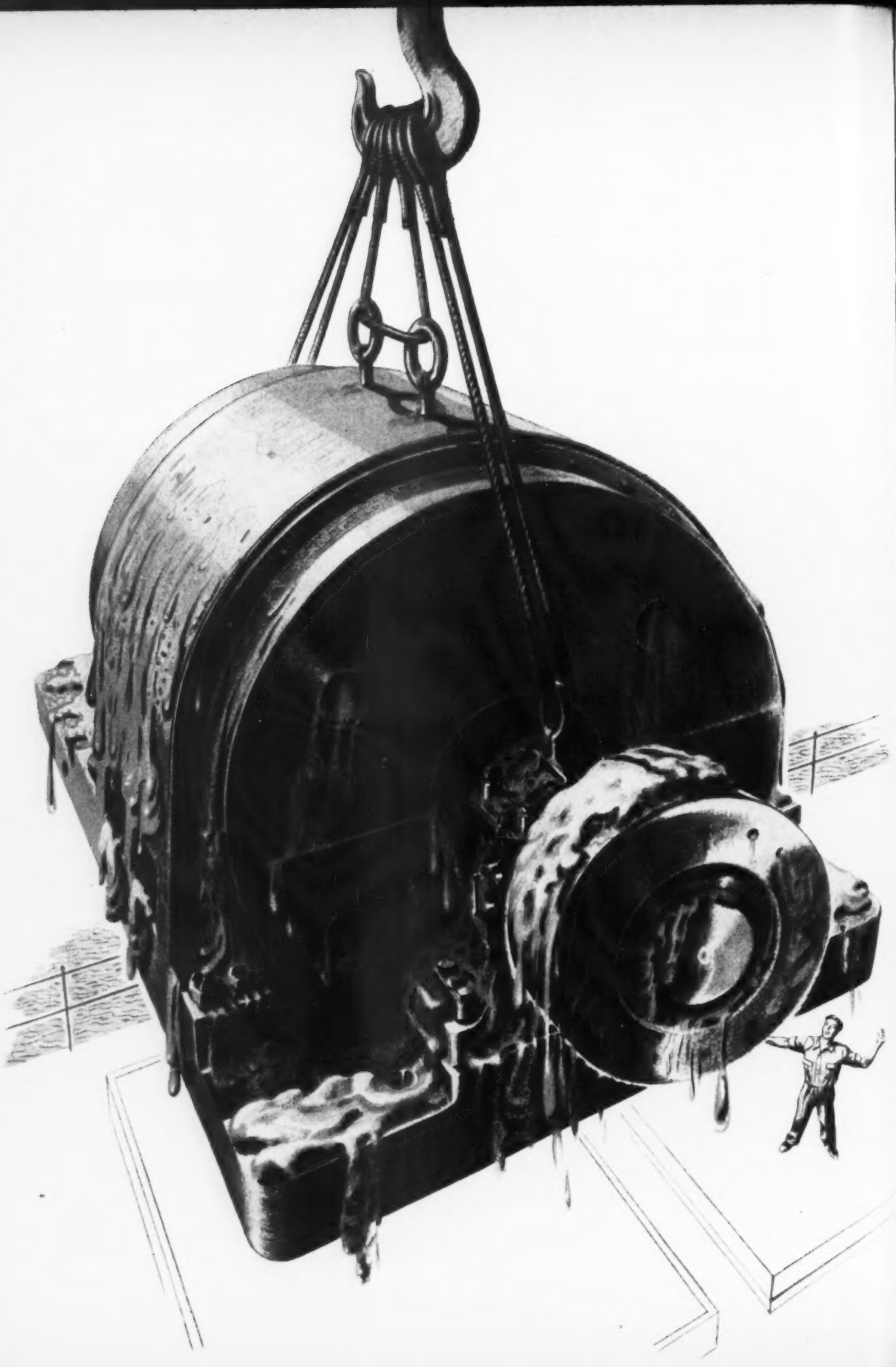

A nontechnical report to management concerning profits

They did what you can do to save money

One way to save money is to restore damaged equipment to useful service.

This mid-west dredging concern licked such a problem by salvaging two 1500 h.p. synchronous motors and related electrical equipment that had spent three months in 60 feet of Mississippi mud and water.

They turned to Westinghouse Certified Maintenance for help.

In their opinion: "Westinghouse is the only manufacturer with maintenance experience and repair facilities extensive enough to handle such an operation."

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This same equipment-saving and renewing technique applies to every industry, every maintenance problem. It is a part of the total Westinghouse services which you can use to your profit . . . for application, installation, disaster and emergency or periodic maintenance.

We want to do the kind of planning with you that will apply this Certified Maintenance service . . . to save time, to save money, to make money, to produce more with what you have. Your nearest Westinghouse office can show you how. Westinghouse Electric Corporation, Pittsburgh, Pennsylvania.

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...*our salesman*

puts this team to work for you!

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Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

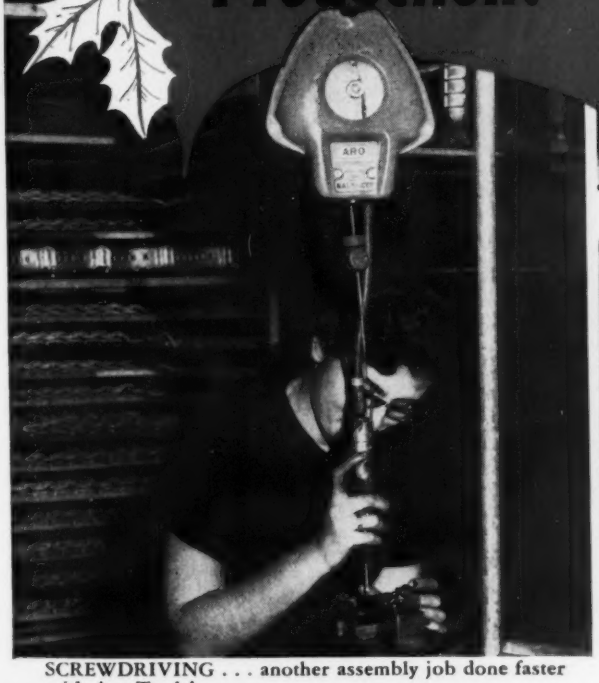
UNITED STATES STEEL

ARO

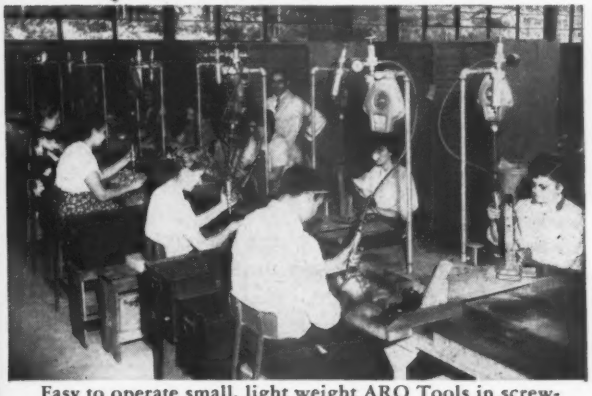
AIR TOOLS help LIONEL Speed-up Christmas Production!

Small size, light weight makes ARO Tools handy for close-quarters assembly.

NUTSETTING is simple, speedy, with Aro Tools and Balancers.



SCREWDRIVING . . . another assembly job done faster with Aro Tools!



Easy to operate small, light weight ARO Tools in screwdriving or nutsetting.

Here are some of the many ways that ARO Air Tools keep production rolling for Lionel Corporation . . . assembling a great variety of toys in their plant at Irvington, N. J.

Let an ARO Field Engineer help you solve production problems in screwdriving, nutsetting, grinding, sanding, drilling, mixing, etc. Write ARO or see your ARO distributor.

The Aro Equipment Corp., Bryan, Ohio
Aro Equipment of Canada, Ltd., Toronto, Ont.

DRILLING with Aro Tool saves time in assembling toy locomotives.

ARO

The Leader!
AIR TOOLS

Also... LUBRICATING EQUIPMENT... HYDRAULIC EQUIPMENT... AIRCRAFT PRODUCTS... GREASE FITTINGS

BARRETT

POWEROX

. . . a Stand-out in design, performance and value!

Cuts costs . . . electrically!

NO OTHER TRUCK can match the work record of a Barrett PowerOx when it comes to saving time and labor. Electricity is faster—costs less than muscle power. Just press buttons and PowerOx does the rest . . . puts 2 and 3-ton loads where you want them quickly and easily. With this streamlined beauty, one operator does more than 3 or 4 using less efficient methods.

SEE WHAT POWEROX GIVES YOU!

Electric drive—travels at walking speeds . . . Electric push-button lift—4 inches in 4 seconds . . . High frame clearance—no snagging on ramps or uneven floors . . . Easy steering—through 270 degrees for narrow, cramped aisles.

Write for PowerOx Bulletin 4861. Also Catalog Describing the Complete Barrett Line of Money-saving Materials Handling Equipment

BARRETT-CRAVENS COMPANY
4643 S. Western Blvd., Chicago 9, Illinois

Standard Cycle and Supply Co., 1811 E. Sprague Ave., Spokane, Wash.; F. E. Bennett, 426 N.W. Sixth Ave., Portland, Oregon; Roll-Rite Corporation, 801 Jefferson St., Oakland 7, Calif.; Irving G. King & Co., 821 Mateo St., Los Angeles, Calif.; Material Handling Equipment Co., 1437 Elliott Ave., West, Seattle 99, Washington.

BARRETT

Barrett Handling Equipment

ONE MAN DOES MORE THAN 3 OR 4 . . . WITH A BARRETT

Models PO and POK Platform PowerOx . . . here is the easiest maintenance you ever saw. Designed with the maintenance man in mind. Walkie type for skid handling. Also the *Pallet Ox* for pallets. 4000 lb. capacity

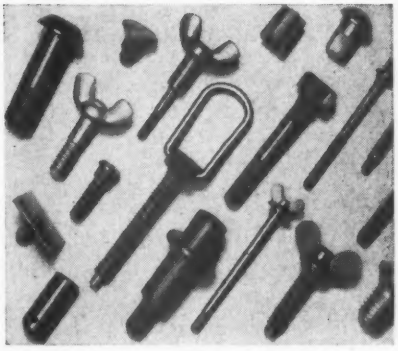
Model TX Tractor Ox. Designed for towing and pulling. Maneuverable in tight quarters. Has 700 lb. drawbar. 20,000 lb. rolling capacity.

Model TTF20 PowerOx telescopic tilting fork truck. Indispensable where palletized loads are used. Ideal for overhead storage. 2000 to 3000 lb. capacities. Lift—10'.

PRACTICAL ANSWERS TO *YOUR* fastener problems

WHAT?

. . . Whether you need standard or special fasteners, "National" can supply your needs. We produce a complete line of standard fasteners right here on the West Coast. We can make special types such as those shown here for practically any need.



WHERE?

. . . "National's" Los Angeles plant is less than 24 hours shipping time from your plant. "National" sales representatives in cities indicated are quickly available to help you with your fastener problems.

HOW?

. . . "National's" modern production equipment and strict quality control—plus expert workmanship—are your assurance of top quality. You can depend on "National", as many leading manufacturers have for more than 60 years.

Write or phone . . . to your nearest "National" representative, or contact us direct.

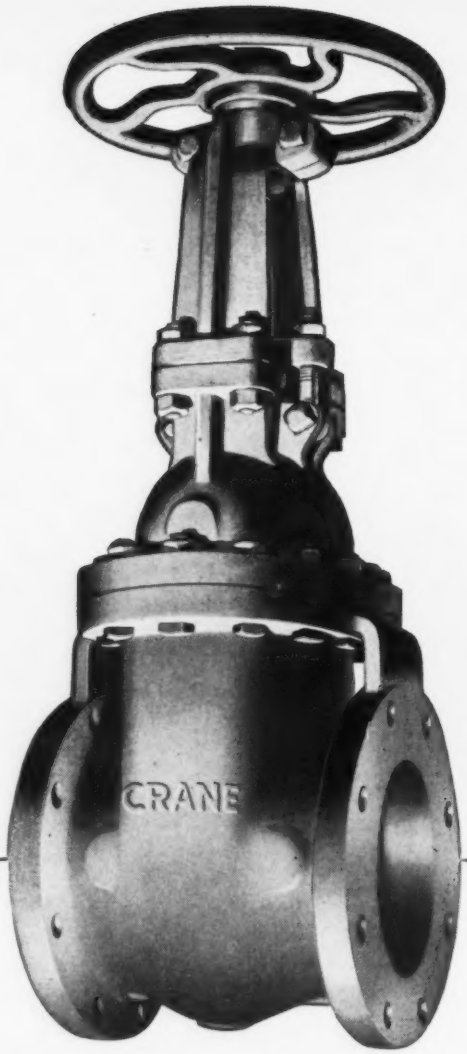
NATIONAL SCREW & MFG. CO. OF CAL.
3423 So. Garfield Ave., Los Angeles, Cal.
Div. of The National Screw & Mfg. Co., Cleveland 4, Ohio

FASTENERS HODELL CHAINS CHESTER HOISTS

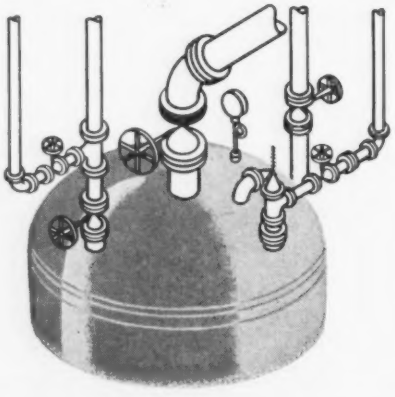
National PRODUCTS

This CRANE VALVE took a load off the maintenance budget

This case shows the thrift that results in buying quality valves. They save production losses as well as maintenance costs. Here, in a starch plant under corrosive conditions, this Crane valve outlasted other valves more than 5 times. And it still continues to give perfect service. That's what Crane quality means in valves for every service.



Read these Facts of the Case!



Where Installed: On raw materials inlet to starch converter. Valve constantly exposed to corrosive effects of hydrochloric acid vapors from converter, at working pressure of 50 psi, 280 degrees F.

Trouble Encountered: Valves formerly used needed repairs every 2 to 3 weeks, and had to be replaced every 3 to 4 months. Down time for converters was excessive; valve maintenance costs ran extremely high.

Solution and Result: The trouble was stopped by installing Crane Ni-Resist cast iron gate valves with 18-8 Mo Alloy trim. Inspected after giving 19 months' service without interruption, these Crane valves were still in excellent working condition.

More CRANE VALVES
are used than any other make

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5 • Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

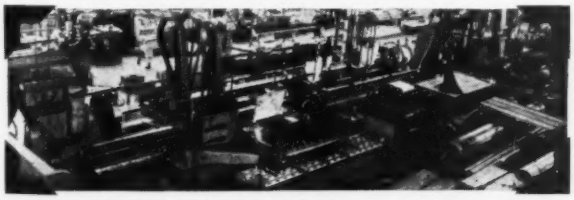
STANDARD ENGINEER'S REPORT

DATA

LUBRICANT	Calol Vistac Oil
UNIT	72" open-side planer
OPERATION	Machining heavy-duty metal parts
CONDITIONS	Extreme pressures
PERIOD	4 years
FIRM	Lamb-Grays Harbor Co., Hoquiam, Wash.

Tacky oil on planer ways assures precision work!

WHEN CALOL VISTAC OIL replaced another lubricant on the main ways of this 72" open-side planer, its constant, even film helped to assure truer cuts for the Lamb-Grays Harbor Co., Hoquiam, Wash. Previous oils used by the company had gummed quickly, left deposits on ways, and seriously affected precision.



"NO TROUBLE OF ANY KIND" is the report from Lamb-Grays Harbor Co. since they changed to Calol Vistac Oil in 1948. Calol Vistac Oil is also used in reduction gears, motor heads, air-tools, and heavy-duty plain bearings. It comes in several grades and may be applied by wick-, ring-, or drip-feed oilers.

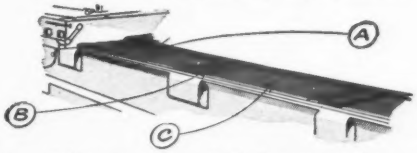
FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, is ready for you. Write or ask for your free copy today.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

THE PRESSURE-RESISTANT FILM of Calol Vistac Oil stays on the ways even under extreme loads. For example, when work weighing up to 7½ tons was carried on the 10-ton bed of this planer, the "high-oiliness" film did not squeeze off, despite the 17½ ton load.

How Calol Vistac Oil Cuts Costs on Metal-Machining Equipment



On machine ways, in hoist gear sets, motor gear-heads, air hammers, heavy-duty plain bearings—stays put and saves wear because of viscous, tacky nature. Atomizes quickly and stays fluid at low temperatures.

A. Special additives help form oily, pressure-resistant lubricating film...won't run off slow-moving parts.

B. Economical—small quantity will lubricate efficiently, dissipate heat.

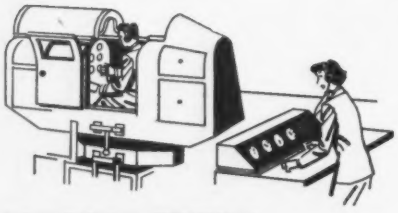
C. Tenacious film cuts power loss and wear.

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

STANDARD OIL COMPANY OF CALIFORNIA

MANY INDUSTRIES BENEFIT WITH AMERICAN BLOWER AIR HANDLING PRODUCTS

Need corrosion-resistant fans for process work? Equipment for dust or fly ash collection? Do you have a specialized or complicated ventilating problem? Read how American Blower Air Handling equipment can help you.

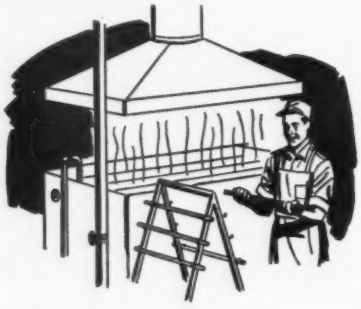


PRECISION TESTING

Long before aircraft instruments are accepted for use, they are thoroughly evaluated in special laboratories. And in the testing of precision instruments, as with many other processes, close control of temperature and humidity is vital. Recently one of the newest and largest instrument laboratories selected American Blower equipment for heating, ventilating and temperature control — a fine compliment not only to American Blower quality but also to our own research and testing methods.

DO AWAY WITH DUST

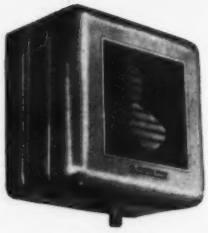
If you have a problem involving dust or fly ash collection, American Blower will be glad to help you. We have a wealth of experience in this field which covers both dust and fly ash removal in industry and public utilities as well as the recovery of valuable materials from air. In addition to local, on-the-spot assistance from our branch office personnel, a modern fully equipped research laboratory is maintained in Detroit to serve you.



FUME REMOVAL

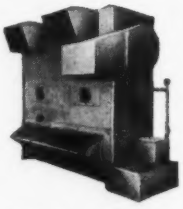
If you're planning to enlarge your metal-processing facilities American Blower offers special fans to handle the corrosive fumes, gases or vapors. For example, some corrosive gases are necessary to process work and must be circulated in the system with corrosion-resistant fans. In other cases, fumes and gases which affect the health and comfort of employees must be safely and effectively removed.

Whatever your requirements American Blower heating, cooling, drying, air conditioning and air handling equipment will improve over-all comfort and efficiency in your business. For specific information, phone or write our nearest branch office.

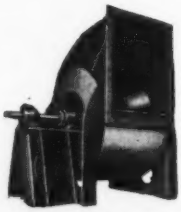


Unit Heaters

Ventura Fans



Air Conditioning Equipment



Industrial Fans

Utility Sets

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
WEST COAST PLANT: SAN LEANDRO, CALIFORNIA
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

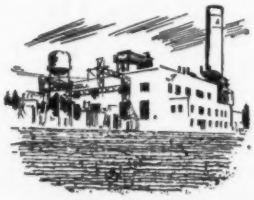
YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

New Powerful Weed Killer Cuts Fire Hazards

for

INDUSTRY



Du Pont CMU

KEEPS GROUND BARE OF WEEDS AND GRASS

Du Pont CMU kills weeds and prevents regrowth. It controls most species that are a problem around West Coast industrial locations, and it is easy to use because a little CMU goes a long way.

- Eliminates fire hazards caused by unwanted vegetation. Applied just before or during the rainy season, it stops growth early for dry-season protection.
- Saves labor, cuts maintenance costs. One easily applied spray takes the place of hand cutting, mowing and other maintenance.
- Economical, low application rates keep ground clear through an entire growing season or longer.
- Kills most broad-leaved weeds and grass at any stage of growth. Best results for the money come with early applications just before or during the rainy season before weed growth starts.
- Comes as a powder to mix with water. Non-flammable, non-volatile, non-corrosive to equipment.

Where do you want to kill weeds?

Wherever vegetation is an eyesore, or is causing a fire hazard or a maintenance problem, CMU is an effective means of control. For full details, mail the coupon.

DU PONT
REG. U.S. PAT. OFF.

150th Anniversary

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

W

Check Here

E. I. du Pont de Nemours & Co. (Inc.)
Grasselli Chemicals Dept.
111 Sutter St., San Francisco, Cal.

( ) Please send me full information on Du Pont CMU.

( ) Please have a Du Pont technical serviceman call to discuss my special weed-control problems.

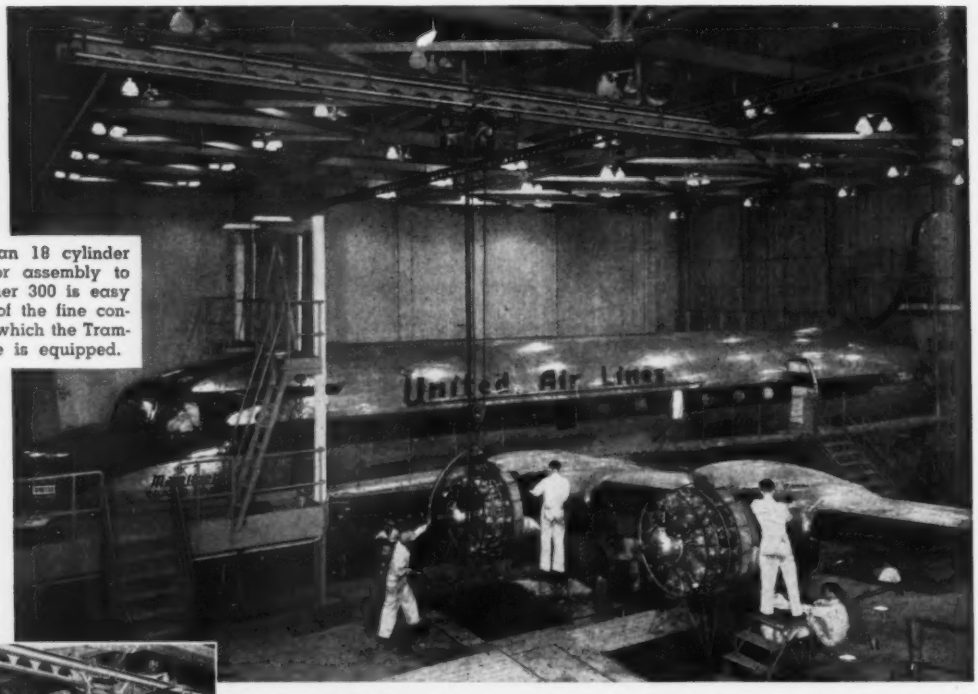
*Name*_____

*Firm*_____

*Street*_____

*City*_____ *State*_____

TRAMRAIL CRANES serve United Air Lines San Francisco Base



Spotting an 18 cylinder engine for assembly to a Mainliner 300 is easy because of the fine control with which the Tramrail crane is equipped.

Assembling an outer wing section to an inner wing is a delicate job that is greatly simplified by the push-button-controlled Tramrail crane.

ACCURATE SPOTTING OF LOADS A BIG FEATURE

All planes of the United Air Lines are flown regularly to the company's mammoth, modern "Push-button" maintenance base at San Francisco Airport for servicing. While various intermediate servicing operations are conducted at other hangars along the flight routes, this is the main maintenance base where planes are given complete overhauls.

The planes are dismantled in three large duplicate shops located at one side of the building. These shops, which easily accommodate United's huge Mainliner 300's, are each served by a 3-ton fully motorized Cleveland Tramrail crane.

Bridge and carrier travels of the cranes are provided with automatic accelerating control. With this control various speeds are obtained automatically by depressing the pendant push-buttons. Hoists are provided with variable-speed push-button control. This control makes it possible to spot loads accurately, which is of extreme importance. For instance, when engines are installed, there is a myriad of pipes and fittings that must be matched precisely without damage.

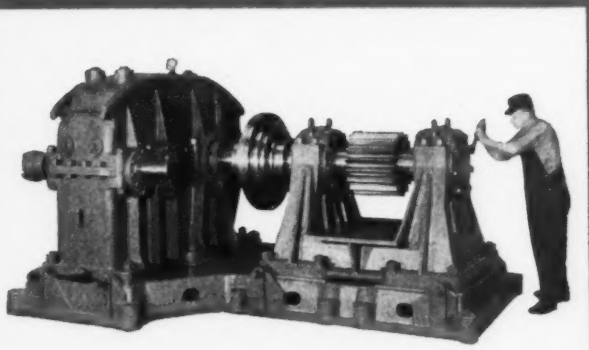
GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
8856 EAST 284TH STREET • WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

When It Comes to
POWER TRANSMISSION
On the BIG JOBS
Look to... Jones



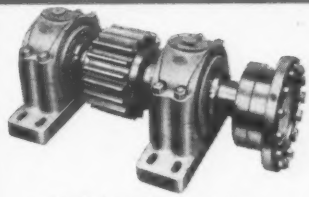
Cement Kiln Drive

SPEED REDUCERS AND COMPLETE DRIVES TO 500 HORSEPOWER

HERRINGBONE WORM GEAR WORM HELICAL

JONES Products—*While specifically* designed for the heavy industries — *are competitive for all applications.* All the added values of sturdier design, heavier construction and better materials are yours without extra cost.

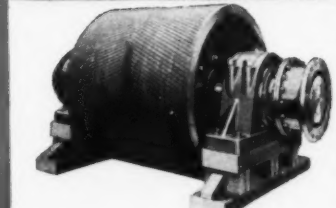
Ask for Bulletins



Shaft Assembly Mounted on 4-15/16" Pillow Blocks

PILLOW BLOCKS to 9" Shaft Size

Timken Equipped, Adaptor Sleeve Type
Self-Aligning, Dust-Tight
Sizes to 4-15/16" in Stock



Jones 60" x 57" Rubber Covered Pulley mounted on 9" Jones Timken Pillow Blocks

CAST IRON CONVEYOR PULLEYS

Tailor-Made to Your Requirements.

CUT GEARS

to Your Specifications

HERRINGBONE - WORM
HELICAL - BEVEL - SPUR

Spur Gear and Pinion Stand

W. A. JONES FOUNDRY & MACHINE CO., Chicago 24, Illinois

WESTERN REPRESENTATIVES

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Phone: VAndike 1359

DENVER AREA
E. C. Wild Company
825 S. Milwaukee St.
Denver 9, Colorado
Phone: SPruce 2852

EDITORIAL COMMENT

We Asked For It

LET NO ONE fancy that all will necessarily be sweetness and light as far as the West is concerned just because a Republican administration is taking over in Washington. If the change is truly corrective, federal spending in the West is likely to be considerably reduced, and outcries against the economies may not be effective if the new administration holds its ground.

Eisenhower undoubtedly spoke with both sincerity and understanding when he said the military budget could be cut considerably without jeopardizing national safety. If there is intelligent pruning, the spigots of unnecessary construction and outfitting of military posts, extravagant equipment contracts and illogical stockpiling may be suddenly turned off. The $1½ billion already approved for investment in defense plants may undergo a sharp tapering off from here on in.

We might even find the "specs" for aircraft and ordnance contracts sharply studied by impartial experts to determine whether the jobs can be produced economically. That would be something!

Other means of governmental economy can easily be found. Both the Reclamation Bureau and the Army Engineers could be required to justify every dollar of expenditure, instead of spending without check. That also would be something!

Not all the blame can be laid on the government. Not by a long shot. Much of the excess spending results from civilian importuning of our Congressmen and Senators to "bring home some bacon."

In many respects this importuning resembles the demands of an earlier day that new highways be routed through the center of town in order to help local business. Nowadays big cities and small towns alike realize that such a supposed blessing is really a curse.

Let us hope that 1953 is the year of awakening to the fact that overspending is in reality a curse rather than a blessing.

Easier Identification

THE CUSTOM of the chairman (or toastmaster) at a luncheon or dinner, in calling off the names of all those at the head table, asking them to rise as their names are called (no applause, please, until all have been introduced), is so time-honored that we hardly venture to comment on it. Quite possibly King Tutankhamen did it this way back in early Egyptian days and the custom has defied all attempts at change.

But it has its drawbacks. Consider the poor peasants sitting at the other tables, trying to keep the names and faces straight in their minds and finally settling for just one or two out of a line of 20 or more VIPs.

Couldn't some discerning public relations man, or program chairman, figure out a scheme for putting their names and company identifications at the front edge of the head table, or perhaps on the wall behind them, so all present could really figure out who is sitting at that table? Might also be an idea to have a mirror arrangement so that the right side of the speaker's table could get an idea of who is on the left side.

IN OUR MAILBOX

Learning Curve

Editor, *Western Industry:*

I was interested in reading the two articles by Mr. Ghormley . . . the application of the learning curve has been of prime importance to the aircraft industry, both in pricing activities and as a tool used by management in controlling costs. Any additional investigation of the learning curve is always helpful, and I was glad to be able to refer some of our subcontractors, who tend to question its existence, to your articles.

R. A. HALL
Director, Industrial Engineering, Estimating and Scheduling,
Douglas Aircraft Company, Inc.
Santa Monica, California

* * *

Editor, *Western Industry:*

Your series "The Learning Curve" (Sept. and Oct. issues) serves a purpose which can be served in no other way. Skill and knowledge in the use of the learning curves and objective measures of supervisors in terms of the behavior of these curves may be brought into isolated industries like ours through a few scattered individuals. However, without the authority *Western Industry* lends to these techniques, they go, for the most part, unnoticed or untried. Thank you for the boost.

J. A. LEE
Supervisor of Training
Kennecott Copper Corporation
Ray, Arizona

* * *

Editor, *Western Industry:*

We would appreciate information regarding reprints or tearsheets of articles appearing in *Western Industry.*

At this time we would like to obtain reprint of "The Learning Curve," appearing in the September issue.

DAVID CRENSHAW
Chief Engineer
Columbia Electric & Mfg. Co.
Spokane, Washington

* * *

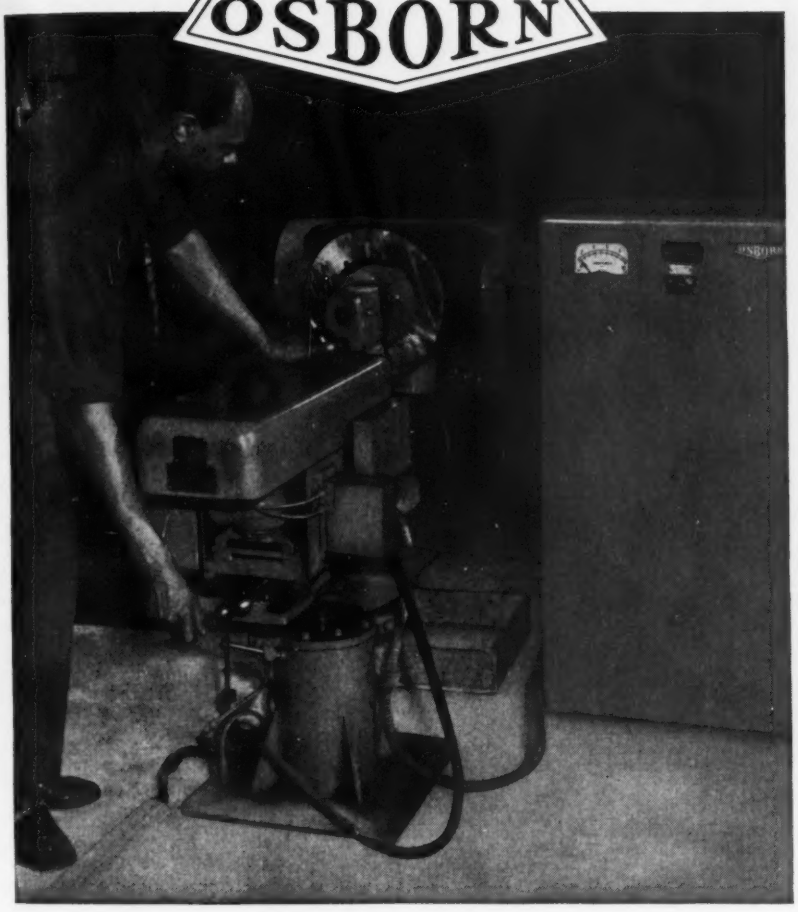
Editor, *Western Industry:*

Through a friend of mine I have learned of an excellent article in your September issue. This article is "The Learning Curve" by Glen E. Ghormley. Since I have been unable to secure a copy of this publication, I wonder if you would be so kind as to send me a tearsheet of the article. It would certainly be beneficial to me.

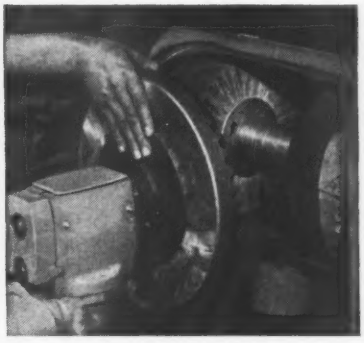
OTTO A. DWORAK
Chief of Subcontracting
Consolidated Vultee Aircraft Corporation
Fort Worth Division
Fort Worth, Texas

(The four letters above are self-explanatory. Western Industry *is deeply grateful for the opportunity to be of service to its readers along such lines, and suggestions for additional topics to be discussed are welcome.)*

OSBORN



SET-UP IS SIMPLE. The machine is versatile. If your production involves small runs of many different types and sizes of gears and similar parts, you can specify machine settings for each part and operator can make set-up changes easily and quickly for maximum daily output. The complete brushing cycle is controlled automatically by the electronic timer which is set for any desired brushing interval to suit the size, shape or condition of part being brushed.



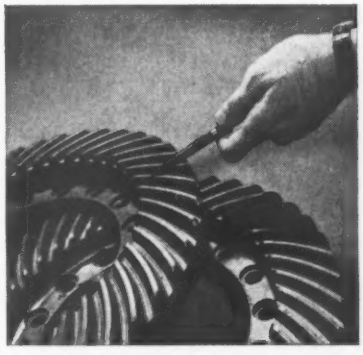
OPERATION IS SPEEDY. The operator mounts the gear easily and quickly. The gear advances to the face of two rotating Osborn brushes and the edge of the gear teeth makes contact with the brushes. To assure fast, positive action on each piece brushed, an automatic control reverses the direction of brush rotation on every cycle of operation.

Deburrs gears 15 times faster at the push of a button!

Want to break a big bottleneck in the production of gears and similar parts? Manufacturers are doing just that with the Osborn Work Holder Brushing Lathe.

In the plant of the White Motor Company, Truck Division, Cleveland, Ohio, this Osborn machine deburrs and finishes gear teeth 1570% faster than the old method. This was done formerly with a portable grinder . . . a tedious operation that took 25 minutes for the 14-inch hypoid gears shown. Now, an operator simply places the gear in the Osborn Work Holder Brushing Lathe, pushes a button and the machine does the job automatically. Floor-to-floor time is only 1½ minutes! Uniformity of finish results in additional time savings in matching and assembly of gears.

It will pay you to investigate this high-speed, high-quality machine for deburring and finishing gears on a production basis. Call your **O**sborn **B**rushing **A**nalyst today or write *The Osborn Manufacturing Company, Dept. 922, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



RESULTS ARE UNIFORM. Burrs and sharp edges are removed uniformly. Every gear tooth has smooth, uniform rounded edges. Surfaces are blended.

INVESTIGATE IT TODAY

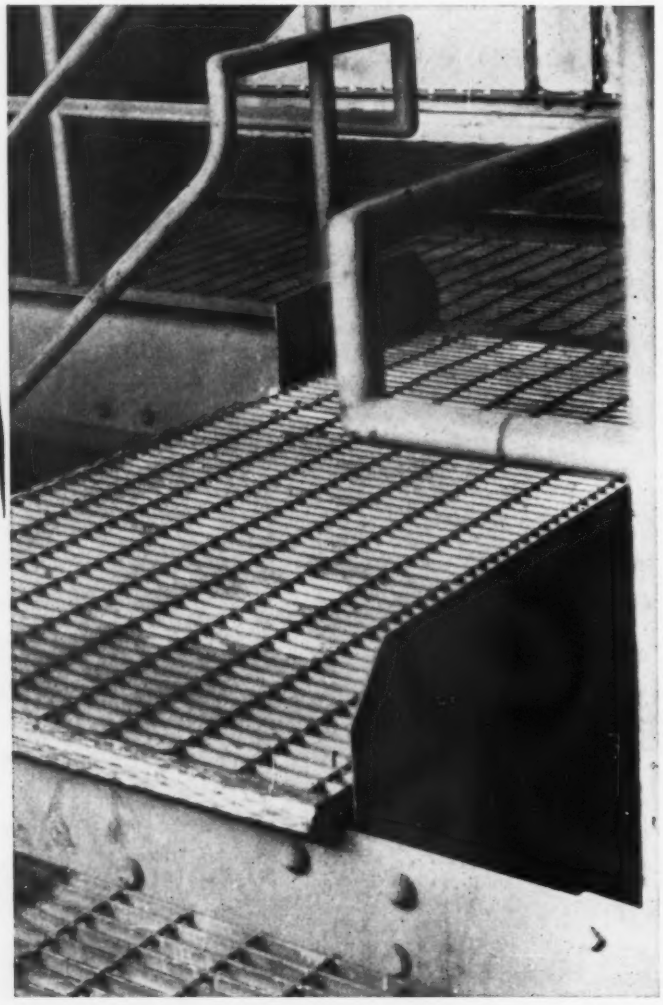
for *your* problems. Users report time savings ranging from 20% to 1570% with the Osborn Work Holder Brushing Lathe. Let us demonstrate what it can do for you!

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES CARRIED IN STOCK BY LEADING INDUSTRIAL DISTRIBUTORS IN WESTERN STATES

BLAW-KNOX *ELECTROFORGED* STEEL GRATING AND TREADS

Another Typical Blaw-Knox Installation



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BRODHEAD STEEL PRODUCTS CO.

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3938 Wilshire Blvd.
Los Angeles 5, Calif.

J. M. Moore
903 U. S. National Bank Bldg.
Denver, Colorado

CALENDAR OF MEETINGS

1953

Jan. 12-14—The American Dehydrators Association convention in Phoenix, Ariz. Convention headquarters will be at Jokake Inn and Paradise Inn, Phoenix.

Jan. 19-20—Northwest Canners Assn. regional meeting in Seattle. Contact C. R. Tulley, 514 Board of Trade Bldg., Portland, Ore.

Jan. 22-23—Canners League of California's Annual Fruit and Vegetable Sample Cutting at Fairmont Hotel, San Francisco. Contact M. A. Clevenger, 64 Pine St., San Francisco, GA 1-3791.

Jan. 30-31—Fifth Annual Industrial Engineering Institute, University of California, Berkeley.

Feb. 2-3—Same institute, UCLA, Los Angeles.

Feb. 2-6—National Association of Corrosion Engineers, a five-day course in corrosion, University of California, Berkeley.

Feb. 4-6—First meeting of Western Computer Conference will be held at Hotel Statler in Los Angeles. Contact George H. West, Sycamore 4-7154.

Feb. 4-6—Transportation and Traffic Engineering Institute's 1953 California state banquet at Berkeley, Calif. Contact Bob Glenn, Bldg. T-7 University of California, Berkeley 4.

Feb. 6-7—American Foundrymen's Society, California region conference, at Hotel Claremont in Berkeley, Calif. Contact A. Ondreyco, General Metals Corp., Oakland.

Feb. 9-10 — California and Nevada Manufacturers of Carbonated Beverages, state convention at Coronado, Calif. Contact George Culley, 20 S. 1st St., Alhambra, Calif.

Feb. 9-20 — Industrial College of Armed Forces national meeting in San Francisco. Contact Colonel Ralph H. Sievers, USA Advance Officer, Industrial College of Armed Forces, Washington, D. C.

Feb. 10-13 — Western States Meat Packers Association international meeting in San Francisco. Contact E. F. Forbes, Western States Meat Packers Association, 604 Mission St., San Francisco.

Feb. 12-13 — Western Frozen Food Processors Association, San Francisco, ninth annual convention at Hotel Casa Del Ray, Santa Cruz. Contact R. G. Free, Santa Clara Frosted Foods, Santa Clara.

Feb. 12-14—Colorado Mining Association 1953 convention in Denver. Contact Robert S. Palmer, 204 State Office Bldg., Denver.

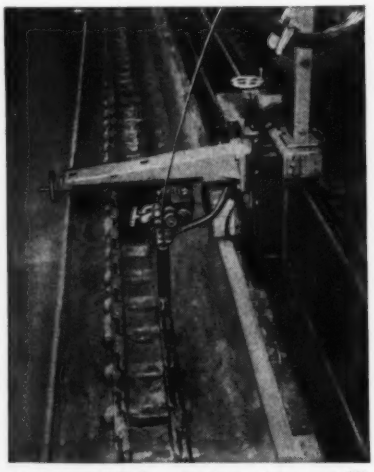
continued on page 30

LINDE'S News of Metalworking

Worn Parts Rebuilt Economically by UNIONMELT Welding

Repair of worn tractor parts is most practical and economical with specially developed fixtures on which standard UNIONMELT welding units are mounted. The metal deposited by UNIONMELT welding is so smooth that no grinding or finishing is required. Experience indicates that resurfaced areas will wear as long as new parts.

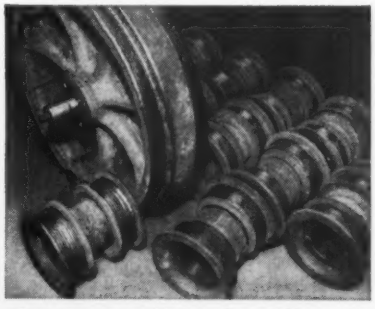
The Berkeley "Conservall" fixture is designed especially for rebuilding crawler tractor track links or rails without disassembling them. The track is placed in a trough and clamped in position. A LINDE side-beam carriage



Tractor rail links rebuilt in "Conservall" machine by UNIONMELT welding. Cams automatically control welding action for each link.

moves the UNIONMELT welding equipment over the positioned track and the welding of each link is automatically started, stopped, and accurately controlled. Rollers, idlers, sheaves, and other circular work can also be welded or resurfaced on another section of the machine.

The "Leader" machine is also available for rebuilding both cylindrical and flat parts. Rollers are rebuilt on top of the machine. Larger parts, such as idlers, are mounted in the chuck at the side of the machine as shown. With the flat work attachment, parts such as disassembled track rail links, grousers, bulldozer blades, end bits and fabricated members can be resurfaced easily. This attachment is operated by a gear which is mounted in the chuck.



These tractor rollers and an idler were rebuilt at a speed of 30 in. per min. by UNIONMELT welding.

With both machines, the wheels can be tilted for rebuilding the flanges. It takes only 80 to 90 minutes to rebuild a D-8 track roller. Idlers take about three times as long.

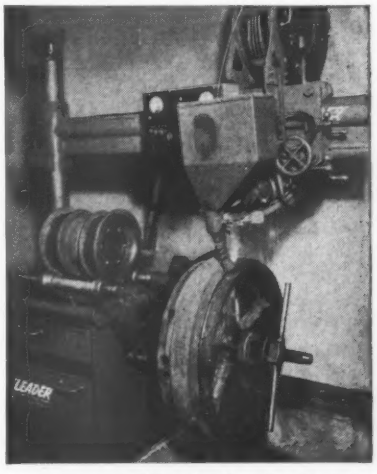
OXWELD 1928 rod is normally used in making these repairs. When wear is excessive, OXWELD 296 rod is sometimes used for the initial buildup which is then finished with OXWELD 1928 rod. For such resurfacing, use either Grade 80 or Grade 90 UNIONMELT welding compositions.

For some services, a finishing pass with a higher alloy tube rod is applied to produce a harder surface. While material of almost any hardness can be applied, one combining hardness and toughness lasts longer than one of higher hardness that tends to spall and chip. As deposited, OXWELD 1928 material has a hardness of about Rockwell C-25, but in service the working surfaces actually develop properties which cause them to outwear deposits that are substantially harder.

Advantages of UNIONMELT Build-up

UNIONMELT welded resurfacing is especially attractive with these automatic machines which readily permit deposit rates of 20 lbs. per hour. Savings in time and the advantages of a smooth uniform deposit justify the initial investment in automatic equipment. Important in these times is the conservation of metal realized with the process. The use of approximately *one hundred pounds of weld metal saves replacement of 2,000 to 3,000 pounds of new parts.*

LINDE's engineers and technicians will be glad to give further information about UNIONMELT welding. Telephone or write today.



UNIONMELT welding head on "Leader" fixture rebuilds rollers and idlers. Rollers are welded on top of the machine, idlers at the side, and flat parts, depending on their size, can be welded on top of the machine or in the flat work attachment.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

The terms "Linde," "Oxweld," and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Engineered . . .

to permit greater load-speed capacity

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COUPLING
The Proven Gear-Type Coupling With Fully Crowned Teeth . . . A Major Improvement In Gearing. This proven gear-type coupling with fully crowned teeth is being utilized in solving a wide range of power transmission problems other than those common to ordinary gear-type couplings.
Pat. & Pat. Pending

THIS FUNDAMENTAL IMPROVEMENT in gear tooth design practically eliminates all "end tooth and tip" contact and provides greater freedom of axial movement. This tooth design accomplishes tight fit on the crown as well as on the flanks. It is the first gear tooth on which all the load is carried on strong flanks rather than tooth edges. It reduces backlash to a minimum. These advantages, plus thrust compensation, and correction for angular and lateral misalignments give maximum relief from coupling failure grief.

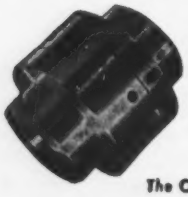
Amerigear Couplings, made in several standard types, are available for standard shaft sizes and a wide range of speed and load capacities. Catalog of standard type Amerigear Couplings is available on request. Amerigear Power Transmission Engineers are available for consultation.

AMERICAN FLEXIBLE COUPLING COMPANY

Originator of the Amerigear Fully Crowned Tooth
Sales Offices in Principal Industrial Centers

ERIE, PA., U. S. A. — *AFFILIATE OF J. A. ZURN MFG. CO.*

Exclusive Pacific Coast Sales Agent **ZURN WESTERN SERVICES, INC.**
1048 Folsom Street, San Francisco 3, California



Write on your Business Letterhead for further information regarding *Amerigear Couplings* with the *Fully Crowned Teeth* and Catalog 501.

Also Manufacturers of
The Original "Oldham Type" American Flexible Coupling

CALENDAR OF MEETINGS

Begins on page 28

Feb. 15-17—Washington Bottlers of Carbonated Beverages meeting at Ridpath Hotel, Spokane. Contact Ed Smith, Secretary of organization, Seattle.

Feb. 16-19—Oregon Dairy Industries, state convention in Corvallis, Ore. Contact G. H. Wilster, Oregon State College, Corvallis.

Feb. 16-21—175th annual meeting of the American Institute of Mining and Metallurgical Engineers at Statler Hotel, Los Angeles. Contact John R. West, 1220 Wilshire Blvd., Los Angeles 17, MAdison 9-2214.

Feb. 22-26—National Sand and Gravel Association and National Ready Mixed Concrete Association, both with national exhibits in San Francisco. Contact Vincent P. Ahearn, executive Secretary, 1325 E St., N.W., Washington 4, D. C.

March 9-13—Mayflower Warehousemen's Assn., national convention in San Francisco. Contact Mr. O. V. Merrill, Merrill Transfer & Storage Co., 424 Ninth St., San Francisco.

March 15-20 — American Chemical Society, national convention in Los Angeles. Contact William G. Batt, Franklin Institute, Newark, Del.

March 23-24—Canners League of California's 49th Annual Directors Conference at Santa Barbara Biltmore Hotel, Santa Barbara. Contact M. A. Clevenger, 64 Pine St., San Francisco, GA 1-3791.

Mar. 23-25—Intermountain Logging Conference at Davenport Hotel, Spokane, Wash. Contact Charles Keim, Kalispell, Wash.

March 23-27—Western Metals Congress and Show, Pan-Pacific Auditorium, Los Angeles. Contact W. H. Eisenman, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Mar. 26—Regional safety conference, Portland Cement Assn. at Davenport Hotel, Spokane, Wash.

Apr. 7-11—Oil Heat Institute regional show at Olympic Hotel, Seattle. Contact Clifton Hussey, Spokane.

April 9-10—Western Cotton Shippers Assn., regional convention in San Francisco. Contact Mr. T. J. Harvey, Executive Vice President and Secretary, 108 E. Fourth St., Los Angeles.

April 21-22 — Twenty-ninth Pacific Coast Management Conference, at the Claremont Hotel, Berkeley, Calif. Contact California Personnel Management Assn., 2180 Milvia St., Berkeley 4, for additional information.

May 4-7—Northwest Electric Light & Power regional meeting at Davenport Hotel, Spokane, Wash. Contact Carl A. Hoffman, Spokane. MA 5115.

How Napoleon's problem solved yours

WHEN Napoleon offered a prize for the best way to feed his fighting armies—the first airtight container was born.

Today, a century and half later, this container has evolved into the familiar "tin can"—the end product of multi-billion-dollar industries, employing hundreds of thousands of people.

For all of us, the tin can has cut our work and improved our health by providing us with a balanced, nutritious diet throughout the year.

It permits us to enjoy the delicacies of many lands. It feeds our armed forces throughout the world.

In countless ways, the versatile can is an essential part of convenient, modern living—thanks to the continuing research and ingenuity of can manufacturers and the canning industry.

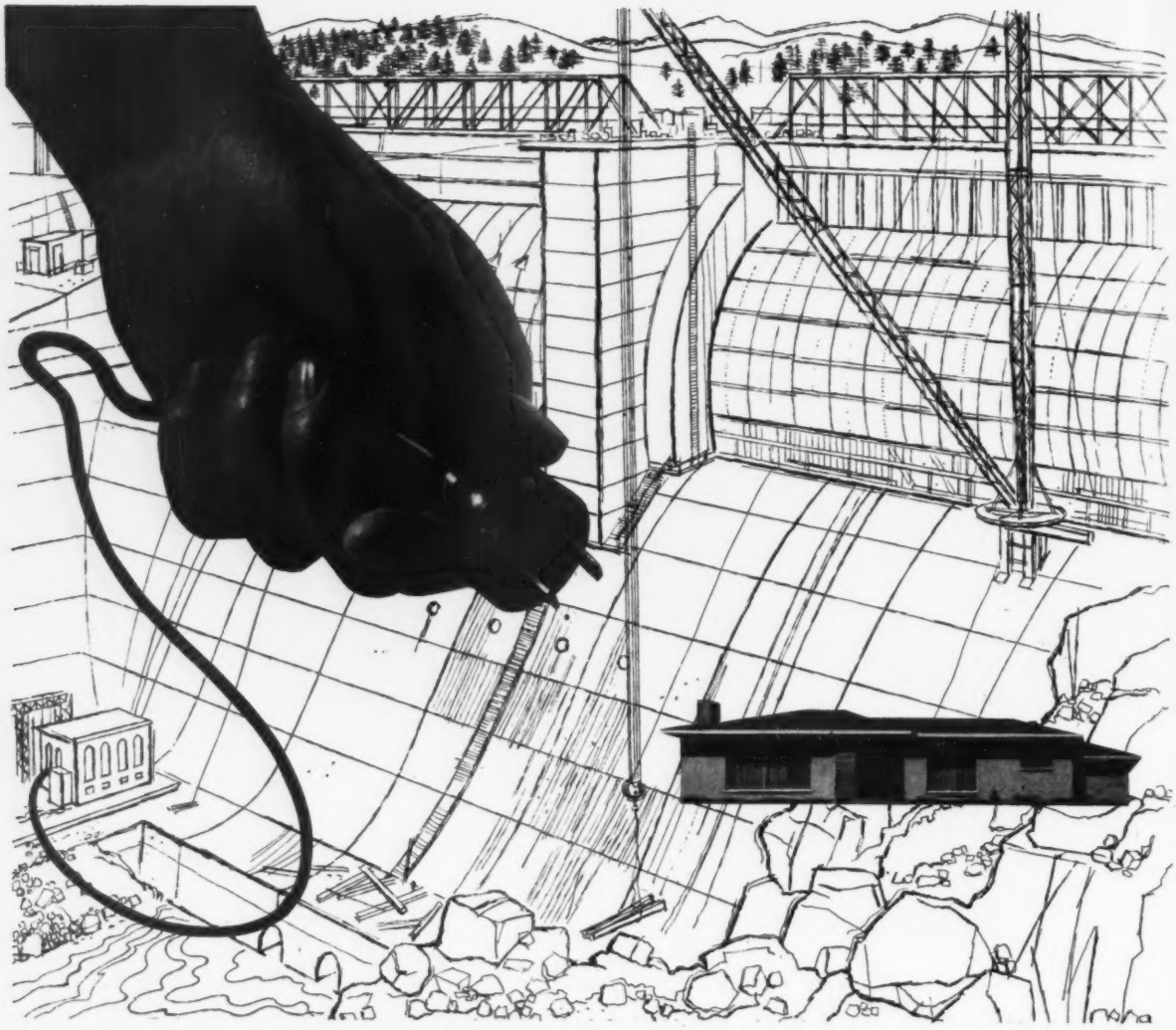
Kaiser Steel is proud to serve this great industry . . . through the production of tin plate at its new mill in Fontana.

It's good business to do business with

Kaiser Steel

built to serve the West

PROMPT, DEPENDABLE DELIVERY AT COMPETITIVE PRICES • plates • continuous weld pipe • electric weld pipe • tin plate • hot rolled strip • hot rolled sheet alloy bars • carbon bars • structural shapes • cold rolled strip • special bar sections • semi-finished steels • pig iron • coke oven by-products
For details and specifications, write: **KAISER STEEL CORPORATION, LOS ANGELES, OAKLAND, SEATTLE, PORTLAND, HOUSTON, TULSA, NEW YORK**



Giant hydroelectric projects are now being built throughout the seven Western states to supply you with more power for home, factory, and farm. The construction of these much-needed projects takes tens of thousands of tons of steel every year.

It takes lots of steel to light your house

Thousands of tons of steel a year go into Western dams

During recent years, many dams have been built to help supply water and electricity for Western homes, farms, and industries. But still the need is greater than the supply. To make up this shortage requires more dams, which every year need tens of thousands of tons of steel—bars, plates, rods, structural shapes, and wire products. Much of this steel comes from Columbia-Geneva Steel Division, the Western producing member of the industrial family that serves the nation—United States Steel.

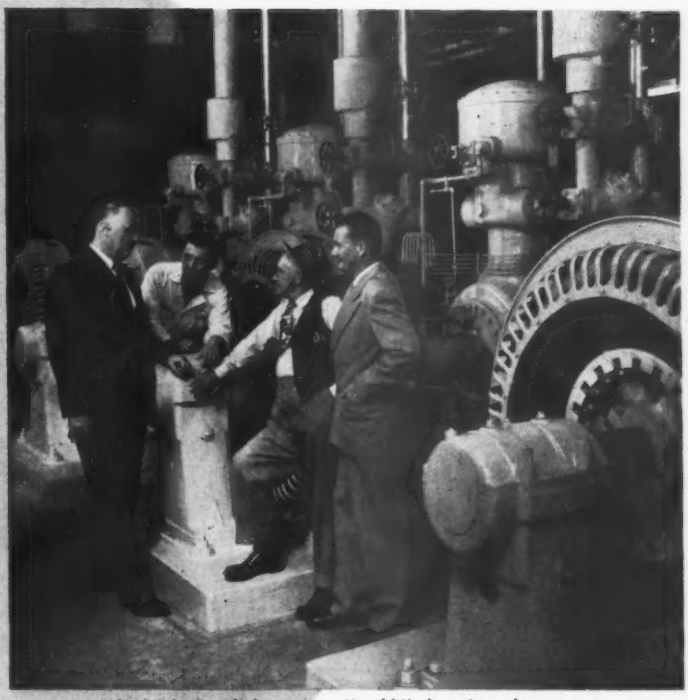
West's largest source of steel

Columbia-Geneva Steel Division

United States Steel Company

UNITED STATES STEEL

AROUND THE CLOCK... G. P. HELPS KEEP BREW *Just Right*



Left to right, Regal's brewmaster Harold Koch, assistant brewmaster Bob Koch, Chief Engineer Lee Buckner and General Petroleum representative Jack Fraser grouped around a Frick compressor.

Regal Pale's copper brew kettle is the largest on the Pacific Coast.

One of the most important steps in the brewing of a fine beer, the cooling process demands precise temperatures—around the clock.

Lee Buckner, chief engineer for the Regal Amber Brewing Co., San Francisco, has found that General Petroleum lubricants enable the plant's costly ammonia and carbon dioxide compressors, used for cooling the brew, to operate continually—without danger of excessive wear or mechanical breakdown.

In the 15 years that Gargoyle Arctic oils have lubricated the Regal Amber compressors, Buckner reports not one instance where so much as a single bearing has had to be replaced.

With a modern plant geared to produce some 50,000 cases of beer a day, Regal Amber officials are quick to point out the value of complete 24-hour protection to their expensive brewing equipment... the kind of protection provided by G. P. products and lubrication engineering.

GENERAL PETROLEUM CORPORATION

Converting nature's gift for better living.

SOCONY-VACUUM

Your plant's machinery deserves the best, too. Call your nearby General Petroleum office today... learn how their specialized lube engineering program can help you reduce inventories while guaranteeing you greater protection and longer life for all your equipment.

11-81

Jenny doesn't live here any more!

YES, in the modern coal mine there's no room for Jenny. Today her job is done by powerful electric locomotives capable of pulling 50 times the load Jenny used to haul to the mine surface.

As a matter of fact, in the modern mine even the traditional pick and shovel are as out-of-place as Jenny herself! More than 90% of *bituminous* coal is now mechanically cut, and over 70% is mechanically loaded. Result: more economical coal to light the way, fuel the fires, power the progress of America.

But, basically, what caused Jenny to disappear? What's behind American industry's evermore efficient machines that turn out goods at lower cost—thus making them available to more people? One word tells the story—COMPETITION.

In the coal industry there are 5,000 privately managed coal companies competing with one another and all competing in the market with other fuels. When one coal company develops more efficient mining methods, the rest can keep pace only by striving to improve even further. No wonder that with his modern machines, developed through competition, the American miner's daily output is 4 to 24 times that of any miner in Europe or Asia—most of whom work in government-controlled coal industries.

Just as competition spurs *you* on to trying harder—it's competition that goads the individual company to deliver products that will outsell others. And it's competition that keeps a whole industry on its toes, cutting distribution costs, opening up new outlets, and delivering better products.

Competition—not government control—has already made America the most productive nation on earth. Competition—not regimentation—points the way to ever greater plenty for all of us.

★ ★ ★

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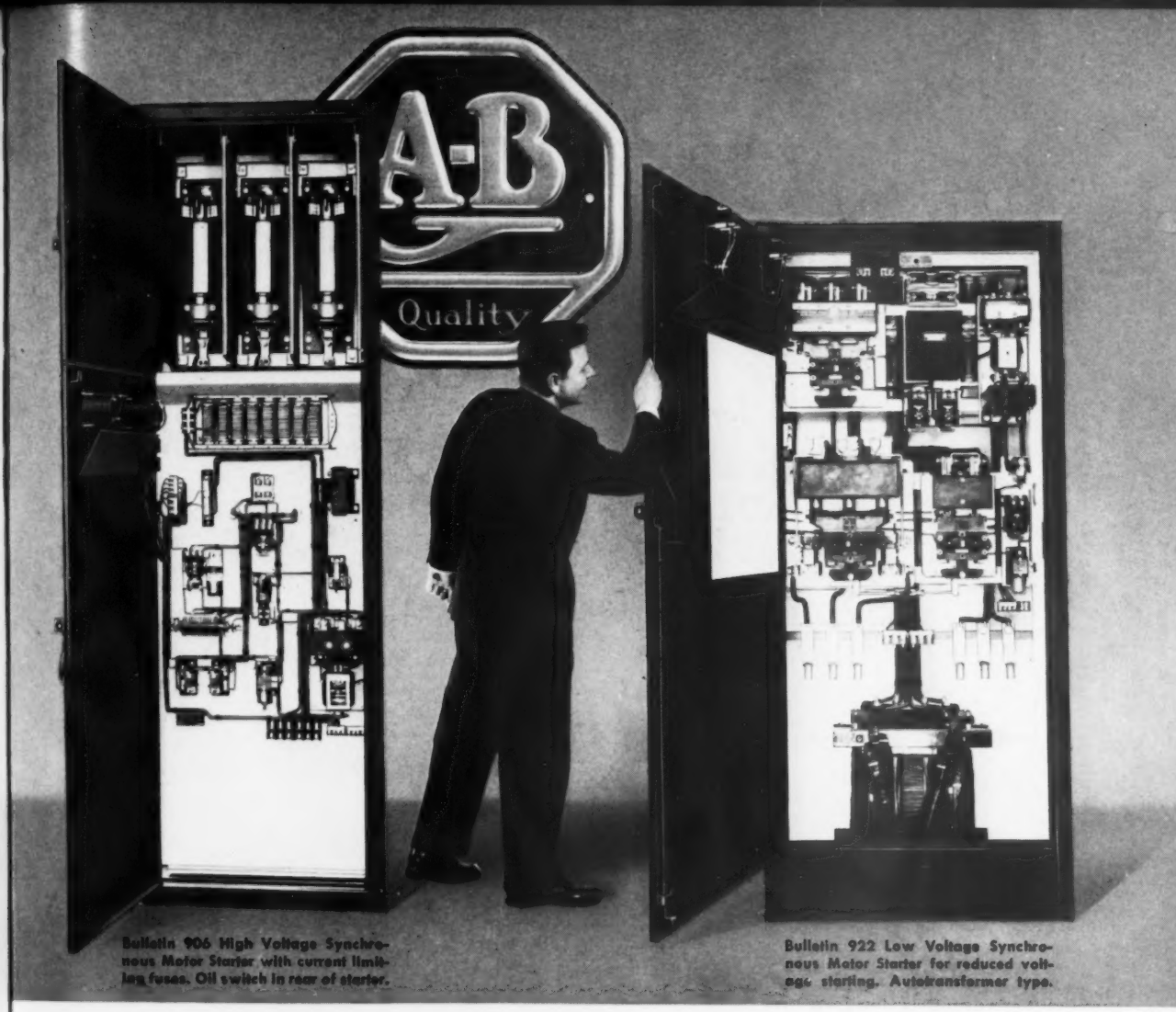
THE COMPETITIVE SYSTEM DELIVERS THE MOST TO THE GREATEST NUMBER OF PEOPLE



Bulletin 906 High Voltage Synchronous Motor Starter with current limiting fuses. Oil switch in rear of starter.

Bulletin 922 Low Voltage Synchronous Motor Starter for reduced voltage starting. Autotransformer type.

STARTERS FOR BIG MOTORS

Bulletin Number	Type of Motor	Operation	Maximum Horsepower 208-220v	440-550v	2000-2500v	2501-4600v
646	Sq. Cage	Manual	125	250	—	—
726	" "	Automatic	—	—	700	700
740	" "	"	300	600	—	—
741	" "	"	300	600	—	—
742	" "	"	300	600	—	—
746	" "	"	300	600	—	—
747	" "	"	—	—	700	700
904	Synchr.	Manual	125	250	—	—
906	"	Automatic	350*	700*	900*	900
914	"	"	250*	250*	—	—
922	"	"	350*	700*	900*	900

(*) At 100% power factor

● The motor starters, shown above, are examples of the many big units in the Allen-Bradley line.

Various types of manual or automatic starters for synchronous motors are available . . . up to 900 hp., 220 to 4600 volts.

High voltage squirrel cage automatic motor starters are listed up to 700 hp., 2000 to 4600 volts. Relays and contactors are time-tested A-B designs, fully protected when specified, by current limiting fuses.

The A-B Handy Catalog is a convenient manual on motor controls . . . large or small. Write for it, today!

Allen-Bradley Co., 1316 S. Second St.,
Milwaukee 4, Wis.

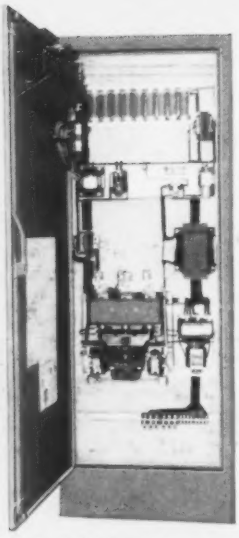
8-52—MR

A-B

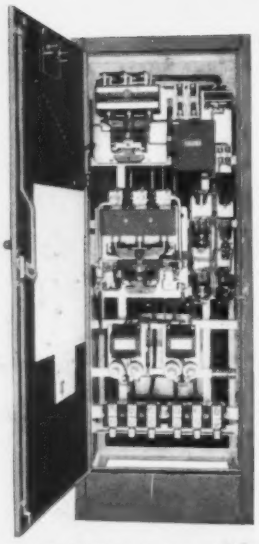
ALLEN-BRADLEY

QUALITY

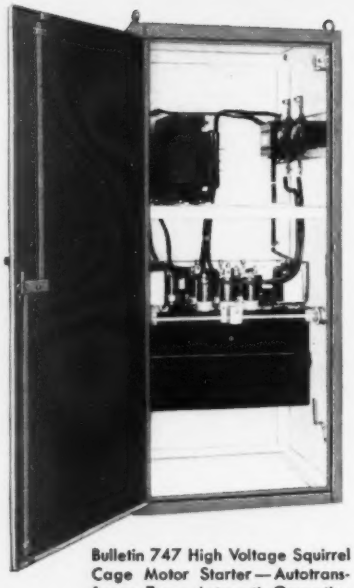
MOTOR CONTROL



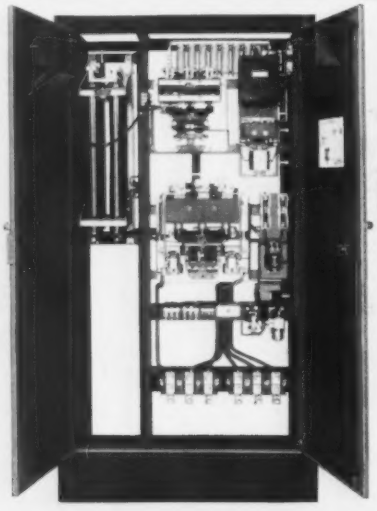
Bulletin 906 Low Voltage Synchronous Motor Starter—Full Voltage Type—Automatic Operation



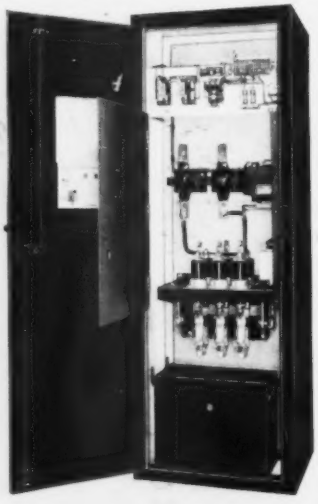
Bulletin 742 Low Voltage Squirrel Cage Motor Starter—Stepless Resistance Type—Automatic



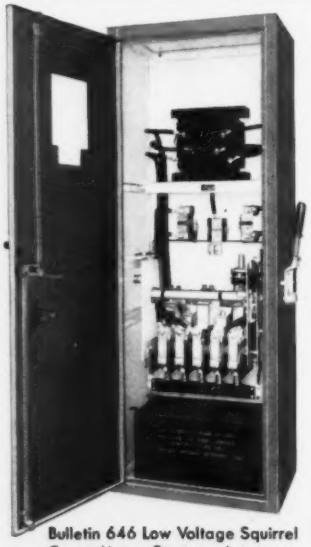
Bulletin 747 High Voltage Squirrel Cage Motor Starter—Autotransformer Type—Automatic Operation



Bulletin 914 Low Voltage Synchronous Motor Starter—Resistance Type—Automatic Operation



Bulletin 726 High Voltage Squirrel Cage Motor Starter—Full Voltage Type—Automatic Operation



Bulletin 646 Low Voltage Squirrel Cage Motor Starter—Autotransformer Type—Manual Operation

Starters for Large High and Low Voltage Motors

The high quality of design and construction, which has made the Allen-Bradley line a leader among motor starters, is built into Allen-Bradley starters for big motors, too.

These big starters can be supplied with all standard accessories, such as contactors for controlling auxiliary equipment, meters and instruments, current limiting fuses, etc. At maximum rating, these starters have an interrupting capacity of 10 times motor full load current.

Standard features of A-B synchronous starters include polarized field frequency relay, automatic resynchronization, thermal overload relays, out-of-step relay, and undervoltage protection. Reduced voltage starting is available either with resistor or autotransformer control.

Standard features of the big A-B squirrel cage motor starters include overload relays. Current limiting fuses are recommended for all high voltage starters.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

Allen-Bradley Company
1316 S. Second Street
Milwaukee 4, Wis.

8-52—MR

NOW! 2 NEW HYSTER® LIFT TRUCKS

Extra-Rugged for "INSIDE and OUTSIDE" Work

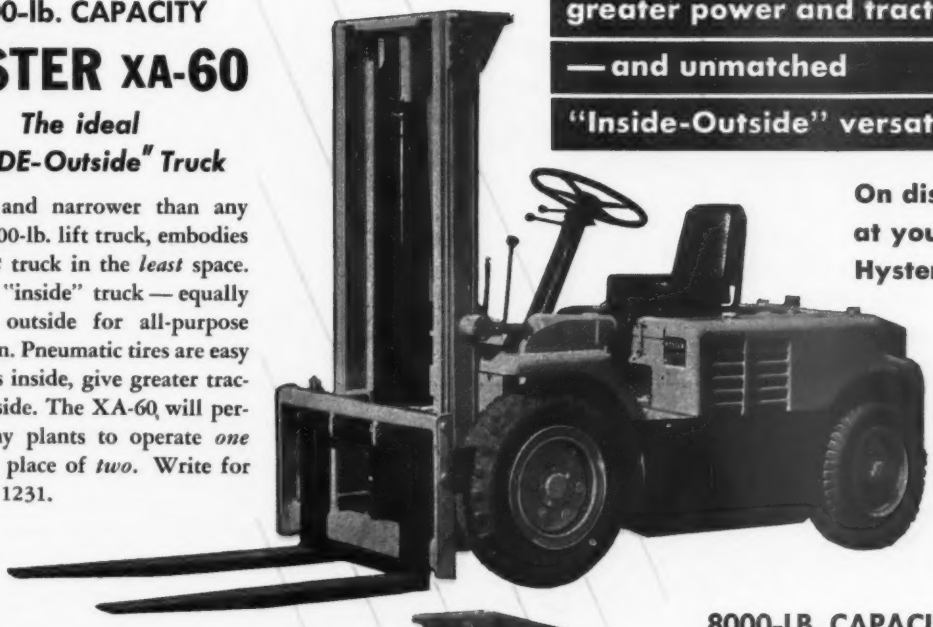
Shorter, Narrower, Faster—with greater power and traction —and unmatched "Inside-Outside" versatility!

6000-lb. CAPACITY

HYSTER XA-60

The ideal "INSIDE-Outside" Truck

Shorter and narrower than any other 6000-lb. lift truck, embodies the *most* truck in the *least* space. A great "inside" truck — equally efficient outside for all-purpose operation. Pneumatic tires are easy on floors inside, give greater traction outside. The XA-60 will permit many plants to operate *one* truck in place of *two*. Write for Bulletin 1231.



On display at your Hyster dealer

8000-LB. CAPACITY

HYSTER ZA-80

The ideal "OUTSIDE-Inside" Truck

Has long wheelbase, but SHORT OVER-ALL LENGTH — for smoother riding and high maneuverability. For use where most of work is *outside*, but truck is *also* required to work *inside* in close quarters. Extremely powerful, with tremendous traction, yet pneumatic tires assure maximum protection to floors. Write for Bulletin 1230.

HYSTER SALES COMPANY
2105 S. E. 7th AVENUE, PORTLAND 14, OREGON..Fillmore 6741
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753 9th AVENUE N., SEATTLE 4, WASHINGTON....ELliott 2401
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HYSTER COMPANY
5301 PACIFIC BLVD., HUNTINGTON PARK, CALIF...LOgan 3291

Be sure to get the whole Hyster "Inside-Outside" story before you buy *any* Lift Truck! Ask your Hyster Dealer, or write for Bulletins 1230 and 1231.

RYERSON

The Industrial P. A.'s Department Store

Here are a few of the many types of steel and related products on hand right now, ready for immediate shipment from your nearby Ryerson plant. Many may be used in place of products that are still hard to get. Check the items you need, and save time by ordering them next time you call Ryerson.

ALLOYS

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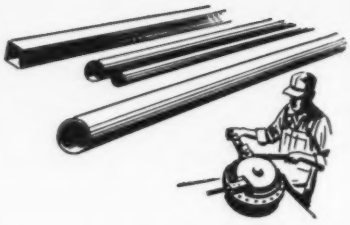

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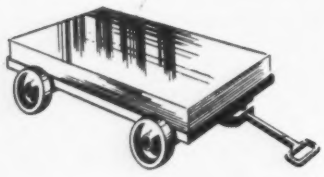

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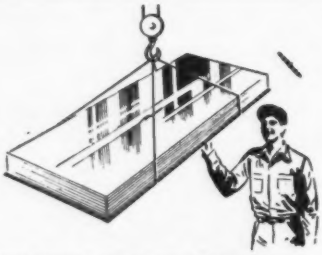

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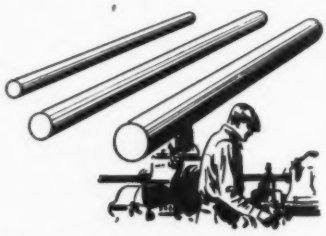

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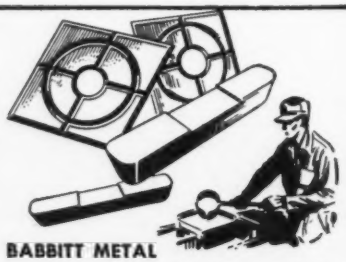

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POWER TRANSMISSION—

By
ROBERT
BERN
President
Power Transmission
Council
of Northern
California

The right drive in your plant will put money in your pocket

EVERY OBJECT that moves must first have power applied to it. Mechanical transmission of that power, from source to end-use, is the point of discussion here.

For this purpose, mechanical power transmission has been divided broadly into three parts: gear drives, V-belts and roller chains.

Power transmission equipment, like a well-organized business or plant, is often taken too much for granted. Things run along quite smoothly most of the time, but troubles are apt to develop at the most unexpected moments. More often than not, these troubles can be traced to an individual—and in the field of power transmission that individual may be either the person who has charge of maintenance of equipment, or the person who has charge of ordering the equipment in the first place.

The accompanying article is designed to make life somewhat easier for both such persons in industry by first telling some of the pitfalls in designing or ordering power transmission equipment and then pointing out some of the most frequent recurring maintenance problems and how best to cope with them.

GEAR DRIVES: "First cost" can fool you

IF YOU are an average American, you own a car of post-war vintage. As this machine represents a fair-sized investment, you take pretty good care of it. The transmission, differential and associated gears in your vehicle, as a rule, are checked every 1,000 mi. If you were to put an average of 30 mph. on this speed, you would come up with something like this: the gear boxes in your car are checked for lubrication every 33⅓ hours of operation.

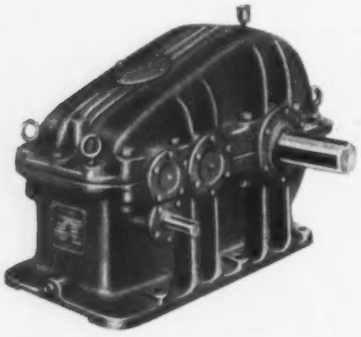
Now let's take another quick look at the gears in your car. About every 300 hr. you drain the transmission and refill with clean new lubricant. Then, in closing this part of our discussion, we will put a life expectancy on your car of 100,000 mi., and at the 30 mph., see how many hours that is—about 3,333 hr. At eight hours a day, this means about 416 days, or a little over a year in operating time. Keep these facts in mind as we go into the next round.

There are a number of parallels to be drawn between the gears in your car and the gears in your plant, but time and space limit us to the most important one—*lubrication*.

Let's start at the first part of industrial gears. The first, and a very important point, is choosing a gear unit that will do the job. Don't let first-cost dollar signs fool you. The writer estimates that 43% of gear box failures, other than lubrication, can be traced back to the demon "First Cost." When buying your first-cost installation, follow this simple rule:

1. Buy only AGMA (American

Gear Manufacturers' Association) rated gear boxes. This insures a standard of quality workmanship, and catalog rating, and costs nothing extra.



HELICAL gear box, much like the differential in your automobile. High power can be transmitted at an angle while revolution speed is stepped down or up.

2. Give the vendor complete information on how you are going to use the unit, where, and under what conditions.

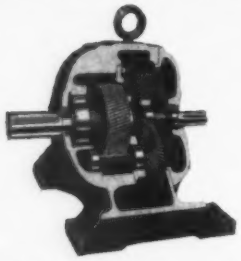
3. Try, if your budget will let you, to buy the next size larger than you need. You may pay about 5% to 7% more, on first cost, but will, as a rule, save at least five times the extra first cost in longevity and maintenance.

4. Sooner or later you will usually have to repair this unit; check the supplier, and see if parts will be readily available for the unit you purchase.

Now, let's say you have made a satisfactory purchase and the unit is to be installed. Protect your investment; take great care to see that the proper lubricant is used, and make a record of same. Be sure the foundation supporting the gear box is firm, and will not settle. Line up the input and output shafts with great care. Be sure the overhung load is not more than was planned for. Make out an inspection and lubrication card.

By now the unit is working for you, so let's see what we have in comparison to your auto transmission.

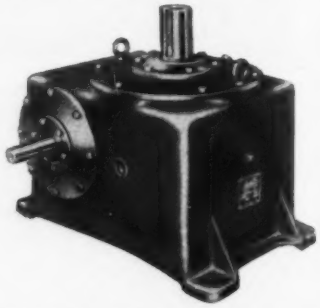
First, you are checking the lubricant in your car, and adding, if necessary, every 30 to 40 hr. Do the same with the industrial unit. Take care that only the proper amount of grease or oil is used; not too much or too little.



IN-LINE helical gear box, a widely used means of transmitting power in direct line but at increased or decreased revolutions per minute.

Now, let's see, you change the lubricant in your car about twice a year, so let's follow the same rule of thumb except in cases of extreme conditions such as temperature, high loads, or long operating hours. In these cases, consult your supplier for proper data.

Worm gear boxes, when the reduction is fairly large, run warm. The warmer they run, the more horsepower is lost before you use it. If you can hold your hand on the unit while running, you are usually safe, but if the heat is greater, call in your gear man and have him check the temperature.



VERTICAL WORM gear box, a common method of transmitting power at right angles. Shafts can be made to turn in any ratio to each other.

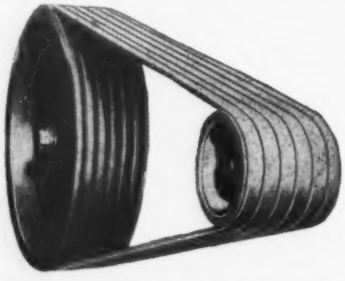
Now, let's make the third comparison with the car, the auto gear box, for a life span of about 416 hr. But—your gear box for a life of 5,000 hr., plus over ten times as many hours of work to be done. True, the average industrial gear box does not have, as a rule, such a tough job as your car's gears with their fluctuating loads and human operators starting and stopping at a rate of about 25,000 times a year. Your gear box in the plant generally carries the same load day in and day out. However, with good care, years of use can be had.

V-BELTS: Troubles are easily remedied

TODAY, MANY PLANTS have converted existing equipment to V-belt drives for improved power transmission. This, coupled with the fact that an ever increasing number of original equipment manufacturers are supplying V-belts on their products, underlines the need for plant engineers, superintendents, and maintenance men to be able to recognize conditions which may be an impediment to V-belt efficiency; and to understand the proper maintenance necessary to insure the maximum life for the drive.

One of the foremost advantages of the V-belt drive is the fact it will run quietly and smoothly under even the most severe conditions. Yet this very feature may shorten the life of the drive! Because it is a "silent sufferer" it often doesn't receive even a periodic inspection.

For the purpose of this discussion we will assume that the drives in the plant were properly designed mechanically—that is, sufficient service factor; allowance for severe shock loads, frequent starting, etc. However, it must be pointed out that an increased production rate, or changing production methods will, sometimes, adversely affect the life of a drive which was correctly designed for the original application.



FAMILIAR multiple V-belt drive, in common use industrially today.

When any production change is considered, take the time to check-out the V-belt drives; or call in the jobber's or belt manufacturer's field engineer for this purpose.

Actually, over 90% of the troubles which can shorten V-belt life can be traced to a very few conditions, all of which are easily remedied. These conditions are:

Tension: True slip can only be corrected by increasing tension—not by adding more belts under the same tension. If using sheave sizes as recommended by the motor and V-belt manufacturers, tension can be in-

creased until slippage is stopped. It is now possible to accurately measure for proper tension on both static and operating drives.

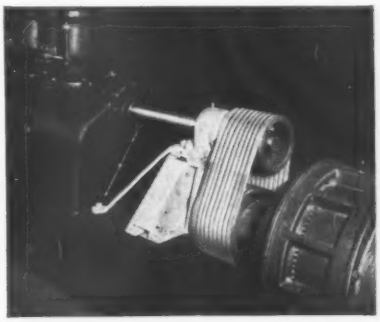
Conditions surrounding drive (oil, heat, dust, humidity, etc.): Rubber compounds deteriorate very rapidly in contact with oil and heat and many chemicals. Specially compounded V-belts are available which will resist most deteriorating elements, and although carrying a premium price, will greatly increase the life of the drive. It must be remembered that high humidity will shorten the tensile members of V-belts. Therefore sufficient take-up allowance should be considered where a drive will be operating in an unusually humid location.

V-BELT TURN-DRIVE accomplishes same general purpose that a gear box does mechanically, i.e., changing direction of power transmission.

Worn sheave grooves: Many plant operators find it difficult to believe that rubber belts will actually wear metal to an extent where the grooves no longer conform to the proper width or angle. As a result, they usually fail to check this factor when looking for the cause of drive failure. *This condition should always be inspected before installing a new set of belts on an old drive.*

Lack of installation and take-up allowance: This is a common oversight during the planning stage of setting up a new drive; and one which can cause a perfectly designed drive to perform unsatisfactorily. If, as is sometimes the case, space, or principals of design, limit the take-up allowance, a "short" set of matched belts should be specified, keeping in mind that sufficient installation allowance must be provided for to prevent damaging the belts by trying to force them over the sheaves.

As stated before, these four conditions can account for practically all V-belt troubles, few as they are. It is obvious, then, that the most effective way to increase the value of your V-belt dollar is to periodically check your V-belt drives for these conditions. Because there are so few things to look for, as shown above, such an inspection can be done quickly *and* efficiently. This very fact, *minimum maintenance time,* is one of the reasons for the wide popularity of the V-belt drive in industry.



MULTIPLE V-BELT drive between an electric motor and a pump, arranged so that the pump turns faster than the motor shaft.

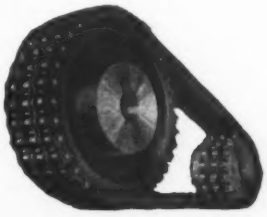
ROLLER CHAINS: Precision needs care

EVERY YEAR brings an increase in the number of roller chain drives used in industry. The roller chain reproduces without slippage the exact rpm. introduced into the drive, plus the fact that it is capable of absorbing a good amount of shock loading. Today the bulk of roller chain and the sprockets used are all made to meet American standards. This standardization means you can repair a chain of "A" brand with parts from brand "B" or "C", etc. The sprockets also follow the same standardization, and the chain from brand "C" will work as well on sprockets manufactured by brand "A" as on their own sprockets. This set of standards means that seldom will a standard chain drive be inoperative for lack of parts.

Roller chain drives are used usually in the slower speed range, from 0+ fpm. up to about 1,000 fpm. Higher speeds are becoming more common but conditions at the higher speeds should be carefully checked (consult chain dealer).

The following conditions are those requiring a roller chain drive:

1. A drive for exact timing.
2. Small space requiring a large reduction in lower speed ranges.
3. Heat or cold, where only a metal drive could survive and centers may be too long for gears.
4. Most all low-speed drives, and heavy service.
5. Where drive must have attachments for conveying materials, etc.



TYPICAL roller chain drive. This type is used where exact timing is of prime importance, or where center measurements may be too far apart for a gear box.

The maintenance of a roller chain drive is important. If care is taken, the life of a properly designed drive will last for many years. The writer had occasion to inspect a large roller chain in a San Francisco laundry, which was still going strong after 28 years of good service.

Some of the important maintenance points are:

1. Be sure the drive is properly designed.
   a. Under-designed drive, while it might save money on first costs, will run maintenance costs up.
2. Check each new chain drive carefully, making sure sprockets are well lined up; use a straight edge for the job.
3. Lubrication is most important for drives from 0 fpm. to about 700 fpm. Manual lubrication at frequent intervals. From 700 fpm. to 1,000 fpm. oil drip lubrication. For higher speeds, a dip or pressure spray (consult your chain dealer).
4. Don't put new chain on worn sprockets. This can decrease the efficiency of the drive, plus shorten the life of the chain.
5. Don't let the chain wear to the point where it will elongate in pitch and wear sprocket teeth.

If you will think of a piece of roller chain as a group of precision bearings (each roller and pin are made to exacting tolerances), you will then see why regular checks on lubrication and alignment are a must for full chain life and little down time.

JUDGING COLOR AND CONTOUR

Combination of overhead and side lighting necessary, Western Pine Association finds

EXPERIMENTAL WORK has been done by Western Pine Association Research Laboratories to determine optimum lighting for lumber grading.

Conclusions were that a combination of overhead and side lighting, balanced for color, provides the best system yet devised for efficient lumber grading. Reactions from graders who have worked under the combination lighting conditions have been overwhelmingly enthusiastic.

Lumber grading involves two visual processes: perception of color characteristics and detection of contour variations. The grader's first impression of the piece is from color characteristics. These include knots (evaluated by number, size and location), pitch and stain (evaluated by amount) and rot (evaluated by amount, location and severity).

Contour Variations

With this initial evaluation in mind, the grader begins to turn the piece, *searching* for contour variations. These include end and roller checks, torn and raised grain, loose of checked knots and skips or prominent knife marks.

When he has evaluated the contour variations he will proceed to reevaluate both color characteristics and contour variations and then grade the piece in conformance to established grading rules.

Under conventional overhead lighting systems, identification of contour deviations is a time-consuming process, requiring several turns of each piece and movement of the grader's eyes along every inch of the piece *in search* of the deviations. When the light is of such quantity and quality that he cannot see the deviations clearly at the far end but does have evidence of them under his fingertips, he will automatically suspect that any deviation is continuous throughout the entire piece.

Laboratory and field work demonstrate that a combination of overhead and side lighting, color balanced, allows the grader to confirm or remove his suspicions and to do either faster and more accurately.

By
A. F. PONGRACZ
Industrial Engineer
Western Pine Association

The laboratory study also revealed that many lighting sources in current use were not completely satisfactory from the color rendition standpoint. In the study, the three most common sources of light now in use for overhead illumination — incandescent, fluorescent and mercury vapor — were installed and reviewed.

Applicable Lamps

Of these three sources, certain lamps, corresponding to each source, were found to be applicable for the combination lighting system. The following sources and lamps (designated by their color) were found to be preferable:

Source	*Lamp*
Incandescent	Daylight
Fluorescent	Daylight
Fluorescent	Standard Cool White
Mercury Vapor	Color Corrected

No conventional overhead lighting system, however, regardless of the amount of light, would by itself show both color characteristics and contour variations equally well, since the first lies in one plane and the second is characterized by difference in elevation. It was therefore necessary to add a second set of lights at a very low angle (Figure 2) to produce grazing incidence or side lighting.

Side Lighting

The advantages of side lighting are threefold. They reveal contour by (1) high lighting, (2) shadowing and (3) both highlighting and shadowing.

Experimentation revealed that a light of high intensity is needed to emphasize contour variations without distorting color characteristics. The R-40, 150-watt reflector spotlight is the most suitable of those reviewed for this application.

A light intensity ratio of 10 to 1 of side lighting to top lighting is needed to accentuate the very smallest of contour deviations. In technical terms, this side lighting, as measured by a light meter or exposure meter, amounts to 200 foot candles to 20 foot candles of top lighting.

Colors

All lamps, because of their physical characteristics, favor certain colors more than others. Since the R-40 spotlight emits a reddish light, an overhead lamp emitting a bluish light is used to create an approximate balance in color rendition. Any of the four recommended lamps listed above will create an approximate balance in color rendition.

Placement of the overhead and side components of the combination system was found to be vital to the system's efficiency. A uniform level of illumination of 20 foot candles (average) of overhead lighting covering the entire grading table area from the side lighting unit for a distance of 11½ feet is desirable to obtain a uniform ratio between top and side lighting. Figure 1 illustrates plans for mounting the four most conventional fixtures being used in the mills.

Moving Fixtures

Present top lighting systems may be altered to meet the recommended light value by moving the fixtures to conform to one of the four plans shown in Figure 1. Any attempt to achieve a higher level of illumination by top lighting tends to nullify the effectiveness of the side lighting. The light intensity ratio of 10 to 1 must be maintained for maximum efficiency.

Determining factors for side lighting a one-man grading table include

sufficient clearance for the lumber to pass underneath, avoidance of hot spots and minimization of ineffective light area immediately in front of the unit. Recommended height (to bottom of unit) is 9¾ in. above chain with a one-degree angle. Using the bottom piece of the unit as a reference, the front edge is 9½ in. above the chain while the back edge is 9¾ in.

Grading Table

For a two-man grading table, the recommended height is 22 in. above chain height to the bottom of the unit with a ten-degree angle. Again using the unit's bottom piece as a reference, the front edge is 20 in. above the chain while the back edge is 22 in. (This installation was found to be less effective than the one-man setup because of the decrease of flat-angle lighting. The added height, however, is necessary to prevent shadow blackouts on the farther lumber when the nearer lumber is turned.)

A greater distance between graders has to be maintained as the width of the lumber increases so that no overshadowing by the grader nearest the unit is noticeable or annoying to the other grader.

It is recommended that the grading table be shielded from both daylight and sunlight by erecting wooden baffles or cloth screens.

The laboratory's lighting study also demonstrated that painting the grading table, as well as surrounding wall surfaces where practicable, enables the grader to relax his eyes occasionally. A restful shade of green is recommended.

Both units of the combination lighting system should be kept clean. Dirty reflectors and lamps can reduce light output values as much as 50 per cent. This variable value becomes more significant when lights are used in combination because of the tendency of one or the other, depending upon dust conditions, to pick up dirt more rapidly. If the lighting intensity ratio of 10-1 increases to 20-1, for example, color characteristics are distorted and contour variations over-emphasized. If the ratio falls under 10-1, detection of contour deviations becomes more difficult so that searching again is necessary.

Since the side lights are of the sealed-beam type, the only concern is the dust accumulation on the outer surface. Daily cleaning with an air jet will insure a constant level of light intensity and add to lamp life by minimizing overheating. A definite maintenance program on the overhead fixture is also essential since the unit's performance is dependent upon the condition of the reflecting surface for both direction and intensity.

Maintenance should also include retention of proper line voltage to secure maximum light output from the lamp. A five per cent reduction on a 120-v. lamp, for example, will reduce light output 17 per cent; a 10 per cent reduction will cut light output 34 per cent.

Figure 1—Four plans for mounting top lighting fixtures

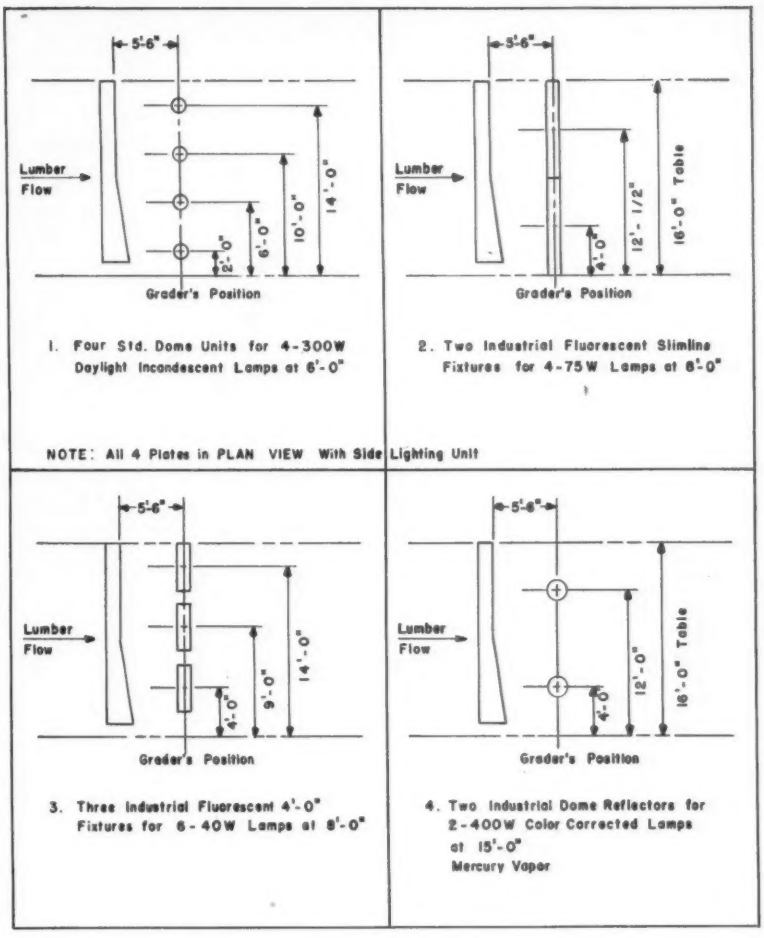
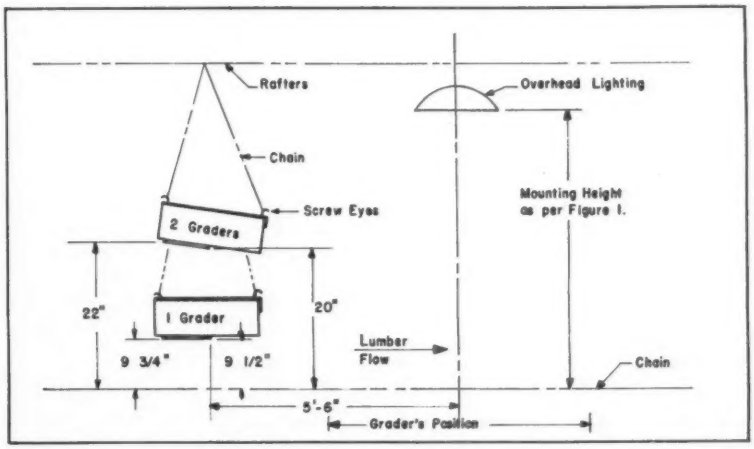


Figure 2—End view for mounting side lighting fixture



(The foregoing article by Mr. Pongracz is a condensation of Western Pine Association Research Laboratory Note No. 45 by the same author. Copies of the Laboratory Note may be secured from the association in Portland, Oregon.)

MICROWAVE

Communication by voice over-the-wire cost is

By ROY C. HENNING

Western Industry's Consulting Editor on Electricity and Electronics

MICROWAVE UNIT and antenna at Newark, Calif., substation of P. G. & E.

PACIFIC GAS and Electric Company, one of the world's largest utility firms, with all its wire and power facilities, has found that voice communication by microwave is less expensive than talking over a completely wired circuit. Many firms with operations over a wide geographic area may find the experience of P. G. & E. interesting and to their advantage.

Since communications are the lifeline of a power company and, paradoxically, without power communications can seldom exist, P. G. & E. took steps to see that it was the master of its own situation by creating its own telephone network.

"Talking on the Highlines"

In the early 1920's, P. G. & E. began by starting a system of "talking on the high lines." This fantastic manner of piping a telephone conversation on the same wires that carry 120,000 volts of high-tension electricity is a practical one, and still in use today. Few people realize as they are driving through the country and look at the familiar lattice towers and graceful sweeping curves of the lines suspended between them that these wires are humming with telephone conversations as well as carrying the lifeblood of industry from a remote mountain powerhouse to factory in the big city.

Today P. G. & E. has over a $6,000,000 communication setup that enables an executive or engineer in his modern San Francisco office to talk to any point in the firm's widespread network of power installations. The first of modern power line telephone carrier installations was made toward the end of World War II.

Power carrier telephone installations are expensive. A voice is carried along the power wires in the form of a radio signal. This is a system of "wired wireless" in fact. Each terminal of the system calls for some rather elaborate equipment to generate low radio frequencies upon which the voice intelligence is superimposed.

A further shortcoming of power carrier telephony is that it must terminate at the substations. In other words, when the 120,000 volts of the high lines is "stepped down" by transformers to 6,000 volts at the outskirts of a city or town so that it can be safely run through the streets on poles or through underground ducts, the telephone circuits are interrupted at the substation.

An Operational Tool

Power line carrier telephony therefore cannot be extended, except by cable pair, into the company's central office of a city because the radio signals on which telephone conversation travels can't pass through the transformers of the substations where the very high voltages of cross-country lines must necessarily be reduced to the safer level for a populated area.

This is a limitation of the power carrier system, but it probably hasn't been any great handicap to P. G. & E. because it is primarily a tool of the operators who control those great arteries of electric power that flow from the many dam sites located deep in the Sierra and converge on large industrial concentrations along the coast. These operators know all the habits of the users of electricity in their particular area; when the farmer begins to irrigate (by electric pump), when the city dweller turns on his house lights, and when the factory starts up its motors.

Multiply all these small individual demands for electricity by many thousands of times, and it spells a huge daily variable flow of power. The operators must meet and

Microwave versus . . .

Western firms who have operations over a widespread geographic area may find, like Pacific Gas and Electric Co. did, that the use of microwave system and equipment is well-suited to their needs. Where more than two or three long-distance conversations (i.e. beyond the local telephone exchange range) are to be carried on simultaneously, this is particularly true. While the cost

INTER-COM

over-the-air at 25% of system used by PG&E

"DISH" ANTENNA on Oakland office building is the link with Newark.

even anticipate these demands before they arise. The role of the company's telephone system in handling communications to all the remote points of the system is a vitally important one. It is an operational tool without which the company couldn't exist.

In addition to the thousands of miles of power carrier telephone, P. G. & E. has erected and maintains many miles of regular telephone circuits of its own.

Strains . . . and Transition

Now you might wonder why, if this vast communication system does all that is required of it, the company entered the field of radio communication. The present trend of industrial expansion in California dictates that large future expansions in power facilities will become necessary on a continuing basis. Growth of power circuits would far outdistance the ability to construct accompanying telephone circuits of the power carrier type.

Microwave radio could be the answer to this problem. If radio is to carry communications for all future power installations and also to eventually displace all present power carrier systems, the transition could take place within the next five years.

Everyone knows that many of his favorite TV programs are brought direct from New York by microwave relay, but few know that P. G. & E. has its own microwave circuit between Newark and Oakland. This installation came into being when it was realized that communication over this link of the system was being badly strained. Many power carrier circuits coming in from north, south and east funnel into the Newark, California, station. The 27-mile hop from Newark (the collecting point) to the Oakland office (the destination) just didn't have facilities for handling all calls that might be presented to Newark station at one time.

To extend power carrier telephone circuits into Oakland would cost approximately $100,000, and power carriers' inherent shortcoming (stopped at substation and carried from there by wire) would limit its path to within eight miles short of its goal, the Oakland office building. The remainder of the circuit would have to consist of a telephone cable run through underground duct. This little item would cost an approximate $40,000. Thus, the cost for extending five telephone circuits for an airline distance of 27 miles would be about $140,000.

Microwave radio was investigated as a means of accomplishing the job. Radio communication is no stranger to P. G. & E., since it has been employing company-owned mobile radio for service operations for some time.

The fact that there is but one transmitter and one receiver at each terminal (no spares) speaks well for the reliability of the equipment on a very vital operation.

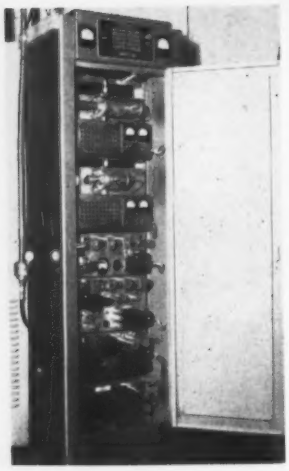
The Line of Sight Problem

A characteristic of ultra shortwave radio is that in the propagation of these waves they have similar properties to that of light. They perform best between two points that are within line of sight of each other. This point is far more understandable to the layman since the advent of TV than it used to be. John Public knows that if the TV station is on the other side of a mountain it is going to be pretty tough to pull his program through unless he puts up a tall unsteady pole for his 17-element Yagi antenna.

P. G. & E. had a similar problem, even more so, since the frequencies they use (953 and 960 megacycles) are much higher and hence more weakened by intervening obstacles than TV channels. Between Newark and Oakland are

. . . wire transmission

of copper wire and the labor to string it has gone up, the cost of microwave electronic equipment has come down somewhat, and the end result is that microwave systems for industrial use are becoming more and more attractive from the cost-of-operation as well as the cost-of-installation standpoint. This is a Western method of getting information across the "wide open spaces."



MICROWAVE UNIT at Pacific Gas and Electric Company's Oakland office.

some moderate-sized mountains that serve as good dense obstacles.

If you can't get through something, you must go over it. Altitude, at one or both terminals, was the answer. A 150-ft. tower was erected at the Newark station, and the parabolic or "dish" reflector antenna affixed to the top and aimed at the P. G. & E. office building in Oakland.

Atop the Oakland office a similar dish was erected, thus putting the two terminals in visual sight of each other. The 27-mile span was then an easy job for microwave radio.

On the transcontinental microwave chain of stations employed by A. T. & T., there are some "jumps" more than twice the distance of this one, but they have nature's aid in the natural provision of high, isolated, peaks for station sites. Excess distances also can be troubleome when refraction effects in the atmosphere bend the signals to the extent that they are not received at the other station.

Since there is only one transmitter and receiver at each terminal, this does not mean that only one circuit is provided. Actually, five telephone facilities are superimposed on the one radio signal. It is possible to have more than this number of circuits if desired.

The greatest need for communications in a power distribution service is when power has been interrupted. Most telephone facilities are "haywire" because the excessive fault currents on power lines also blow the fuses on telephone lines. It is the old story of being unable to pull yourself up by your own bootstraps.

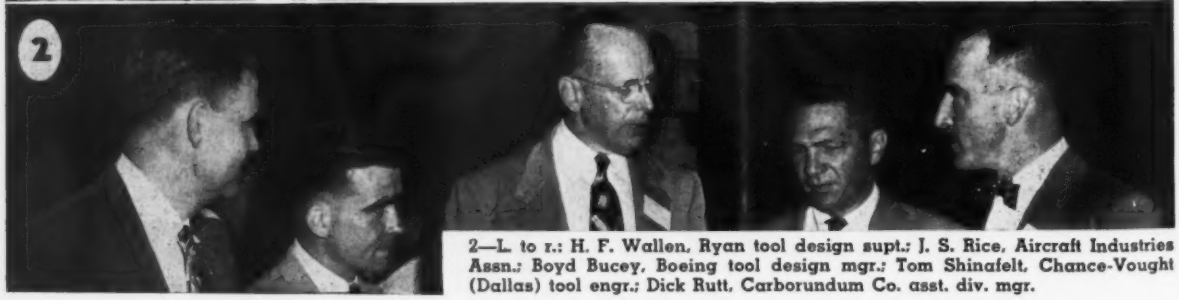
In talking with the station operator at Newark from the San Francisco office of the superintendent of communications, his voice travelled via cable underneath the bay to the Oakland office, and thence by way of Microwave Link to Newark. His voice quality was excellent.

Trouble-free performance of this link would in itself be enough to sell microwave to management, but when it is found that total installation was made for approximately $35,000 instead of the $140,000 required to accomplish the same thing by power carrier, it surely has sold itself.

P. G. & E. (for a power utility) now has one of the largest communications systems in the world with over a $6,000,000 investment in these facilities. It also has one of the largest radio systems with 700 radio mobile units, 175 pack sets and 75 base stations.

AIRCRAFTERS STUDY NEW TAPERING METHOD

1—L. to r.: Doug Hugill, Northrop tool engr.; Dick Gordon, Convair tool engr.; Burt Raynes, Rohr chief tool engr.; Augie Hill, Convair tool engr.; Floyd Matthews, Boeing asst. tool design mgr., and Chas. Glasgow, Douglas tool design mgr., Santa Monica.



2—L. to r.: H. F. Wallen, Ryan tool design supt.; J. S. Rice, Aircraft Industries Assn.; Boyd Bucey, Boeing tool design mgr.; Tom Shinafelt, Chance-Vought (Dallas) tool engr.; Dick Rutt, Carborundum Co. asst. div. mgr.

THE CARBORUNDUM Co., Niagara Falls, New York, and Bell Aircraft Corp., Buffalo, New York, have figured out a new method of tapering aircraft skins with abrasive belts. This grinding technique was demonstrated recently to engineers and production experts from the aircraft industry by Stainless Machine Polishing Corp. of Huntington Park, Calif.

Demonstration equipment included a wide belt polishing machine which had been converted into a wide belt grinder and modified to permit use of a 50-inch wide belt, covering entire width of the 48-inch sheets.

While abrasive belt grinding is generally considered a finishing technique, this demonstration showed cuts up to .070 inches deep over the entire 48-inch section, in a single pass. The belt grinder operates in a fraction of the time required for presently used methods—and with satisfactory accuracy.

THE LEARNING CURVE—

FITTING THE WORKER TO THE JOB

. . . is a more accurate endeavor and much more satisfying to both worker and management, if your judgment is based on the learning curve

(Third in a Series)

By
GLEN E. GHORMLEY
Applied Statistician and Lecturer on Quality Control at the University of Southern California

FIRST OF THIS SERIES of articles listed some relatively safe generalizations about the learning curve, per se, and indicated that it probably has a number of unrecognized industrial uses. The article suggested what some of these uses might be.

Each of the remaining three deals with a potential application and offers some illustrative examples.

In the second, we took up the possibility of evaluating a supervisor by measuring the degree to which he influences the shape of the learning curves of the individuals in the group.

In the last article, which follows this one, we will consider the possibility of evaluating a management policy change by means of the learning curve.

This article, third in the Learning Curve series, will deal with fitting the worker to his job. It will approach the problem of utilizing the learning curve by dealing first with the general problem of placement, and then attempt to justify the learning curve in its setting as a useful tool in the placement procedure.

The importance of proper placement is hard to overestimate. The misplaced employee is an expensive problem to his company. He is expensive because of the waste of the time of the supervisor or other personnel charged with his training, because of spoiled material, because of down-time for repair of damaged machinery, because of proneness to accidents, and because of ineptitude, he may become a bottleneck on an assembly line, thus bringing about low production among others.

Because he is an unhappy person, he creates difficulties for himself where none need to exist. Too often, he becomes a problem to his family and to society while in unsuitable employment.

Although much time and study have been put into the subject and definite progress has been made, we are far from a complete solution. There would seem to be three tasks ahead of us: (1) to make greater application of the principles already known; (2) to increase our knowledge of basic principles and applications by more study, and (3) to widen the use of these principles, both new and old, by publicity and training.

For Better Selection, We Need Better Coordination of the Machinery

Few persons interested in placement will find much to criticize in the theory of a coordinated program presented by Chart 1. It suggests an interesting use of professional vocation counselling, more efficient placement screening, a period of temporary status, and a rescreening before the employee is placed on a permanent status and is considered a part of the employee-family.

At both points of screening, the suggestion is made that we should refer the rejected applicant or temporary employee back to vocational counselling rather than turning him away with some such statement as,

Chart 1. Steps to minimize costly misfits

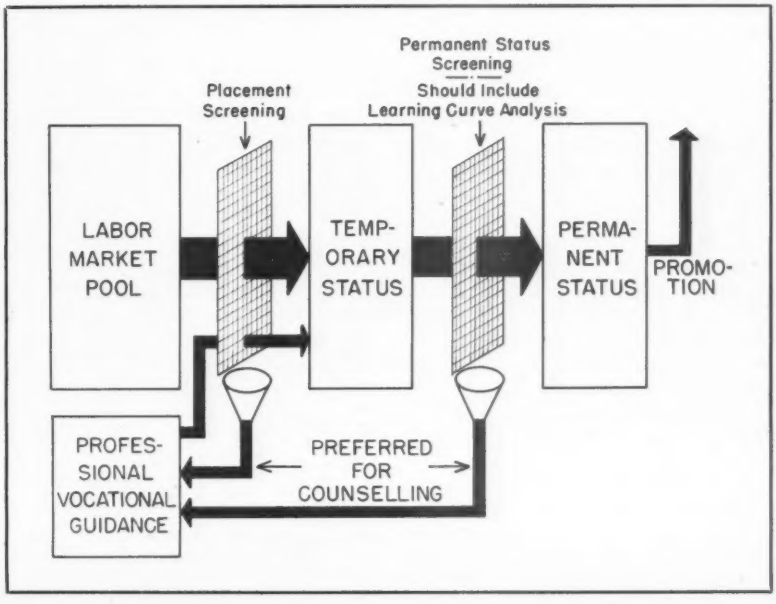
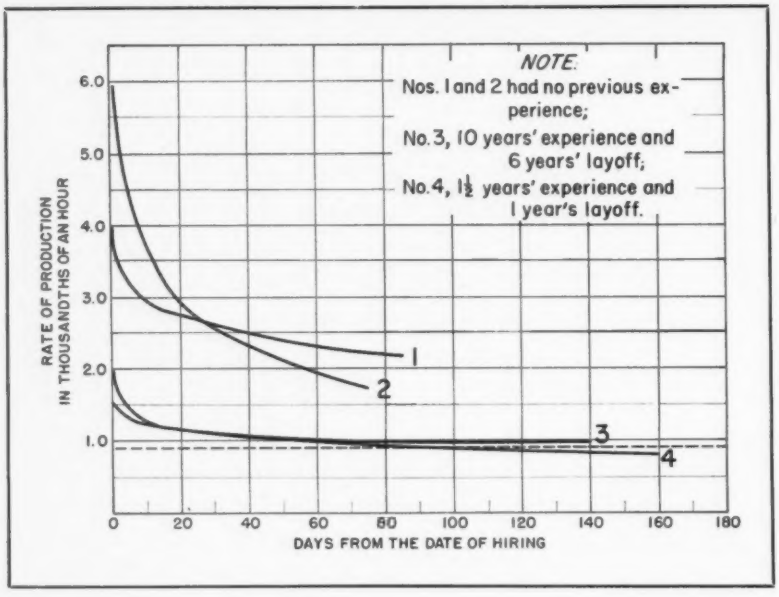


Chart 2. Fitted learning curves of four employees on the same job



"I'm sorry; we aren't able to use you at this time."

Clearly, industry cannot be responsible for vocational guidance, even in cases where the need seems imperative. It is the problem of the employee, with or without counselling, to select a profession or life occupation.

However, industry is far from indifferent. As the facilities for professional guidance increase and the techniques improve, we look forward with a good deal of anticipation to the day when applicants will choose the job they know they want and not so often in an optimistic hope of getting on someone's payroll.

The responsibility of industry for placement begins at the point where an applicant approaches the interviewing window of the personnel office. Most conscientious interviewers own to considerable misgiving about the ability of their selection procedures to pick a good employee. Most of them will confess to glaring errors made in the past.

In spite of abundant evidence to show that the hiring interview as it is usually conducted is all but valueless as a guide to placement, it continues to be in universal use. There is justification for it as a device for orienting the employee to his job, the company and protecting company security. Valid objections to it depend upon its use as the sole criterion for hiring.

Selection Devices Now In Use

As employment officers have become more sharply critical of the entrance interview, they have made increasing use of various psychological tests to fortify their decision. Usually, these tests are of the aptitude and preference inventory variety.

Success with these tests has been spotty. Where they have been well validated and completely analyzed, they have proven a useful and widely accepted tool. Where they have been introduced as a cure-all, and especially where poorly validated and inexpertly analyzed, they have proven disappointing and often have been discarded.

Another point that has stood in the way of their wider adoption is that some selection officers feel that their use constitutes an invasion of the difficult field of vocational guidance. Sensing this area of overlap, they prefer not to become responsible for administration of techniques which are still in the "artistic," rather than the "scientific" level of exactness. That is, the interpretation of the results of the tests depends on the personal skill of the analyst to too great an extent.

The final right of selection and hiring belongs to the prospective employee's immediate supervisor. This is an almost universal procedure and a correct one, since the foreman thereafter will be charged with responsibility for the employee's performance.

Furthermore, it immediately places the foreman in the correct relation with the employee. The employee realizes that he owes his hiring to the foreman rather than to the personnel department.

It is significant that so little use is made of references usually requested

Table 1—Comparing Beginning and Experienced Operators, the Latter After Layoffs.

Operator No.	Previous Experience	Length of Layoff	Fitted Equations	Forecast: Probable Years to Achieve Cycle Time of .0009 Hrs.
1	None	—	$y = .00482x - .166$	65 years
2	None	—	$y = .00881x - .365$	3 years
3	10 years	6 years	$y = .00139x - .059$	8 years
4	1½ years	1 year	$y = .00187x - .141$	1 year

Notes: In the equation, y gives the estimated time in hours for a single item.
x is the number of days since entry on this job.
The constant *a*, for example, .00482, provides the estimate of the time for the first item, based on all available information.
The constant *b*, for example, —.166, is an index of the rate of change. That is, Operator No. 1 reduced her rate by .166 or 16.6% from the first to the second day, .166 between the second and the fourth, .166 between the fourth and the eighth, etc. Each time the period is doubled, the rate per item decreases by the same per cent. A large minus indicates rapid improvement.
All constants are significant at the 0.1% level, as is the difference between a straight line trend and an exponential curve.

Table 2—Forecasts on the Basis of Present Trends.

Operator	Probable Years to Achieve Cycle Time of .0009 Hrs.	Estimated Daily Rate in Ten Years	Estimated Number Produced in Ten Years
1	65 years	6,000 per day	10,500,000
2	3 years	15,800 per day	27,500,000
3	8 years additional	9,100 per day	20,900,000
4	1 year additional	12,800 per day	27,300,000

The estimated daily rate assumes a full 8-hour day with no down time for "bending." About an hour's down time per day is considered normal to the operation.

Table 3

Results of Daily Learning Curve Forecasts from Accumulating Data on Operator No. 1, Who Later Failed, Terminating After 15 Mos.

Day of Forecast	Tentative Estimated Time to Reach .0009 Hrs. Per Cycle
End of 2nd—Tues.	5 weeks
3rd—Wed.	6 weeks
4th—Thur.	14 weeks
5th—Fri.	3 years
6th—Mon.	5 years
7th—Tues.	57 years
8th—Wed.	41 years

Note: The analysis was carried until the first reversed trend, indicating that analyses from here on would probably be randomized about the eventual value as a limit.

of the employee. Any experienced supervisor has been puzzled from time to time at the fewness of the cases where he is called on to report on a former employee.

This noticeable vacuum is apparently attributable to:

(1) the confidence of the hiring officer in his ability to "pick a man at a glance," an attitude far more common than we sometimes realize;

(2) his lack of confidence in the judgment or frankness of the former supervisor;

(3) the frequently pressing necessity of filling a requisition as soon as possible, or

(4) his dependence on the screening process in the plant to weed out the employee who is unsuited to the job.

Obviously, in failing to check references, he tends to delegate to his company's supervisor a greater weight of responsibility for suitable placement.

A Crucial Period

In actual practice, then, our hiring procedures do not pretend to completely screen out all the less desirable applicants. In actual practice, we leave the final screening to a stated or implied probation period. We depend heavily on trying the employee on the job—in the actual working situation.

This procedure is logical. In fact, it is the only practical method. For, no matter how carefully he may have been selected, there will still prove to be unanticipated factors in the work situation to which the worker may not be able to adjust.

Some of those problems that employees are frequently unable to solve successfully are quality of supervision, relationship with other employees, physical environment, mental incompatibility with the requirements of the task and even their families' response to the employment.

It seems clear that the natural way to come to valid conclusions as to how he will react in the entire complex situation is to place him in that situation and measure his reactions. For its own protection, each company should do this with each new employee.

Nor is it a complex nor difficult process if we make two things matters of systematic routine: a report from the foreman backed by an objective yardstick. For measuring the reaction of the employee to the work situation, there is no method so far devised that is the equal of the learning curve on his production. It should never be omitted from the evaluation procedures. It is impersonal, quantitative and known to have value. It knows no favorites, bears no grudges.

The product of the learning curve, it must be emphasized, like all statistical measures, is information. It can be analyzed daily if desired, and the information furnished the supervisor for action. In general, a prompt search by him will reveal which of several factors must be corrected if possible if the employee is to be saved. On the other hand, it will protect the valuable employee and the potentially valuable one from being rejected on surface impressions.

A set of data will illustrate and support the use of the curve for evaluation purposes.

Learning Curve as a Yardstick

The following example was chosen because it contains data on two beginners and two operators with previous experience returning to work after an absence.[1] It is also of interest because, for each pair, the operator who started off the better of the two proved in the end to be the poorer one. This suggests that any selection techniques which depend on measuring the employee's ability at entry but do not consider his potential abilities to improve with practice may rank them in reverse to the true order of value as producers.

All four were hired for the same job classifications in the same company at about the same time and worked under the same supervisor. The fitted curves are shown in Chart 2.

Table 1 reduces these graphs to the respective equations and evaluates the employee on the basis of the probable time it will take him to achieve a rate of .0009 hours per cycle or 1,100 units per hour.[2]

Only one of the four employees could be classified as a failure. In the Tables and Chart 2, she is referred to as Operator No. 1. Both the Chart and Table 3 show that she started out with unusual promise—a promise that was evaporating by the end of the first week, and that had disappeared altogether by the seventh working day. At least in this case, the learning curve was telling us from the fifth day on that she was becoming a problem employee. The hint of the fifth and sixth

Concluded on page 71

Summary and conclusions

CONCLUSIONS reached at this point are, necessarily, tentative and general:

1. The penalty for a misfit is a severe one to the company and may be tragic to the employee.

2. We can reduce the number of misfits in industry by wider and more intelligent use of the techniques we already have.

3. We can also materially reduce the number of misfits by finding better methods than now available at three points:

a. Vocational Guidance
b. Selection Methods
c. Methods of following the employee through his early period of employment.

4. For the first and routine evaluation of the new employee, the subjective judgment of the supervisor should be supplemented by an objective analysis of his rate of progress.

5. The learning trends of the new employee are established at least by the thirtieth day—probably by the twentieth. In some cases, at least, they are set even earlier.

6. If an adverse trend is pointed out by analysis of the learning curve, we should try to identify the cause. If it is under our control, we may be able to serve both the company and the employee by removing it.

[1]For permission to use the data, we are indebted to the Los Angeles Paper Box and Board Mills and its President, William H. Kewell.

[2]The measure used for presentation in Table 3 is somewhat an artificial one. The value of .0009 hours per cycle is a rate that is usually attained by successful operators only after some years of experience. Unfortunately, the writer does not have other examples using this figure as an index. It was only while this paper was in preparation that the Table 2 shows two more estimates of some interest, the estimated daily rate at the end of 10 years and the estimated total production up to that time—both assuming the present trend continues.

YOUR PLANT AND OFFICE DON'T HAVE TO BE MARRIED

Industrially, they work as well when divorced. Here's proof from Magna Engineering Corp. that management likes it better, and so do employees.

(17th article in Western Industry's plant construction series)

Plant in the city . . . Office in the country

The architectural considerations

by

Birge M. Clark, F.A.I.A.
Walter S. Stromquist, A.I.A.

THE MAGNA Engineering Corporation, desiring new quarters for their administrative and research departments, elected to move down the Peninsula to a location where their employees would live near their work, could drive automobiles to work and park literally within a few feet of the place they worked. After various studies it was felt that this building meets the various requirements as follows:

It has been so placed on the site that the orientation is as near ideal as possible. No wings are so wide that natural light does not reach every part. Areas where several people are working have cross ventilation. All rooms look out on pleasant and colorful gardens, patios and planting spaces. The building itself is structurally very simple and inexpensive. Should future conditions greatly change present requirements it would be easy to modify as there are very few structural elements other than the floor and roof. Most walls could be removed if that should be desirable. Provision has been made for fifty per cent expansion of space in a northerly direction. A noticeable feature is the central lunch room where employees enjoy ten o'clock coffee, either indoors or outdoors, according to the weather and temperament. This has been placed right in the center of things rather than at a remote wing. The president's office has been located on the north where glass on three sides does not present a problem of sun control. He is available to visitors or to staff. Research and design has been carefully separated from administration, sales and purchasing. It should also be noticed that there is almost a complete absence of corridors and halls. This might not be practical for larger concerns but in this instance has worked admirably and has increased the close-knit family feeling. We believe that the general principles observed in this administration building, which happens to be located miles from the producing units, could be followed equally well where the administrative unit is on the same large site as the factory.

THIS HAPPY individual is running his Shopsmith. He and a great number of others throughout the world are the reason for Magna Engineering Corp.'s rapid growth.

MAGNA Engineeering Corp., Menlo Park, Calif., is a young company. It is owned and staffed by young people. Their products, both for homeowners and industry, are new on the manufacturing horizon. From the moment you see the building and enter it, see the equipment manufactured by the firm displayed in the lobby, and talk to pleasant personnel, you get the sense and feeling that this whole enterprise is young, aggressive, vibrant, progressive.

That is precisely the feeling the Chambers brothers want you to get when you visit their new plant, because that feeling and sense is the moving force behind the architectural considerations involved when selecting the site, planning the building, designing its details.

Bob and Frank Chambers, the brothers who nursed this company along from an industrial foundling with office in a small building in a San Francisco lumberyard to what it is today, had some pretty definite ideas about getting away from the city—about providing the finest kind of atmosphere in which to work—about working in a place where the climate is good, the neighborhood quiet and peaceful, the general surroundings conducive to content and happiness.

So, when they decided to move the

LOOKING TOWARD the front of the office from the rear, a number of semi-private offices are seen on the right (facing the central court). These translucent partitions are designed and arranged for easy and quick movability.

ENGINEERING DEPARTMENT, well lighted and well ventilated. Note use of filing cabinets on right with built-around wooden cabinet space. These units are used as partitions, serve a double purpose while conserving valuable space.

office location out of a metropolis and into the country, they first took an employee poll to determine location preference of the majority.

A predominance of employees either already resided on the San Francisco peninsula or preferred it as a location, so discussions and action taken were in that direction. Since Sunset magazine had put up a beautiful plant in Menlo Park, and Allstate Insurance Co. was in process of building one—since, also, other companies had given indication that they would erect buildings in that area to house administrative functions of businesses carried on elsewhere, Magna management was attracted to that immediate area and purchased a plot of land for their new home. Their present address is 110 Linfield Drive, Menlo Park.

Birge Clark and Walter Stromquist, Palo Alto architects, were selected to design the new building. Here are the points presented to them by the Chambers brothers—well thought-out architectural considerations the new plant should incorporate:

1. Building would contain sales, merchandising and general administration space.
2. It would include space for engineers, and a small testing shop.
3. There would be provided an area for employee relaxation.
4. The building would be clothed in a modern look with plenty of glass area to take advantage of climate and lend connotation of the modern company that Magna is.
5. It would be a one-story building of rambling type to allow beautiful landscaping and gardens.
6. It would be designed and laid out on the plot for expansion.

End result of cooperative action between the architect and General Contractor Howard White (also of Palo Alto), plus numerous subcontractors, is the building you see pictured on these pages. It has 12,000 sq. ft., costing approximately $13.00 per sq. ft., plus landscaping and miscellaneous incidentals especially desired by the owners and not specified in the original plans.

BUILDING FEATURES

Frame . . . . . Steel and wood.

Roof . . . . . Five-ply built-up tar and dolomite, resting on wood joists supported by steel columns and I-beams.

Foundation . Concrete slab on coarse open rock fill.

Floors . . . . . Asphalt tile (Armstrong) throughout, with these exceptions: rubber tile in the lobby, and carpets on concrete surface in president's office and conference room.

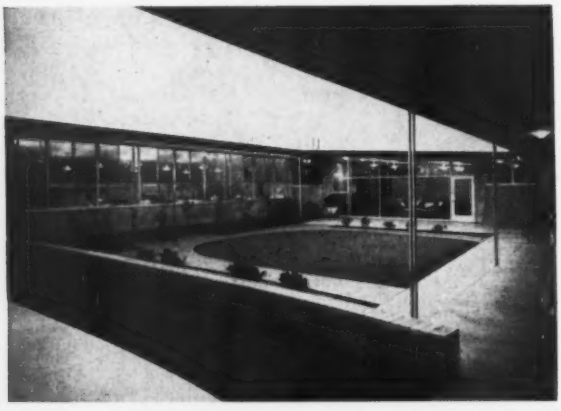
Glass . . . . . Libby-Owens-Ford.

THEY GOT WHAT THEY WANTED

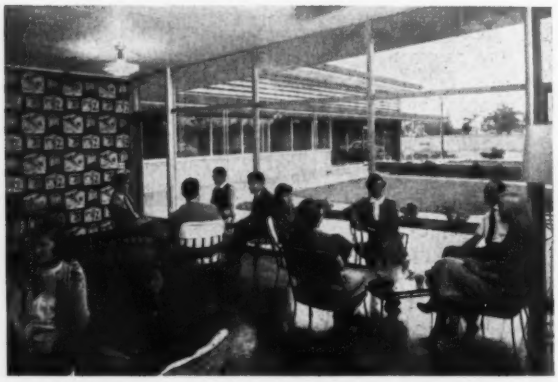
MANAGEMENT wanted a modern, progressive, attractive building in which to conduct administrative and office functions. They wanted to give their employees good surroundings and an enjoyable atmosphere, and keep them happy. Actually, this fundamental works two ways—both to the advantage of management and employee; by keeping employees happy and satisfied, there is less employee turnover, and consequently it is less costly to run a business.

A LOOK INSIDE the president's office. Desks are built-in to the walls. This is an unusual lighting arrangement, with this office projecting out from the main building so that natural light enters it from three sides.

CONFERENCE ROOM, showing use of good natural light combined with good artificial light, and clean, pleasant design.



THIS IS the pleasing view that greets visitors to Magna's new administration building.



RELAXATION ROOM for all hands, this "coffee and donut shoppe" faces out onto the main entrance patio. Modern furniture and decorative treatment make it a real joy to those who use it—and most Magna personnel do just that.

Sash . . . . . Michel & Pfeller steel sash.

Plumbing . . . Standard, throughout.

Heat . . . . . Radiant heat, serviced by American Radiator boilers and controlled by Minneapolis - Honeywell thermostats.

Ceiling . . . . Acousti-celotex, with mineral wool insulation above.

Walls . . . . . Wood stud, stucco, plywood, or plaster.

Ventilation . All natural; no forced air.

Light . . . . . Natural, controlled by set louvers, supplemented by incandescent three-ring lights suspended from ceiling. This uses the entire ceiling as a reflecting surface, gives less shadow, is easier on employees' eyes than some other kinds of lighting. Designed for 45 foot-candles of artificial light at desk height in offices, slightly less in open area where clerical work is done.

Parking . . . . Provision for about 50-car parking area, plus three-car covered carport.

A slogan in time saves nine

SAFETY STRATEGY with a zing has been planned and put into effect by Moore Dry Dock Co. of Oakland—with highly successful results, especially from the standpoint of making employees accident-prevention conscious.

The meat of the whole campaign is a "safety slogan" drawing. Each week a new catch phrase concerning safety on the job is posted over the time gates. It remains there for an entire week. Sometime during this period, the name of one employee is drawn. If this employee can repeat the current slogan correctly, he's in—he receives $10 in a new wallet.

In case he has not been farsighted enough to memorize the vital words—the prize stays right where it is until the next week's drawing when another employee has an opportunity to win $20—and so on until someone wins the cumulative total. Ordinarily, the awards have a quick turnover.

This plan has been in operation at Moore Dry Dock since last February, and by this time, people working there are pretty conscious of safety principles such as . . . "A fool discards machinery guards" . . . or . . . "A live wire is full of fire" . . . or . . . "Safety starts between the ears" . . . and . . . "A good grip prevents a slip."

Having these doctrines in mind seems to be more than a good start in the direction of constant vigilance and care in preventing accidents. Moore Drydock Company finds that it pays.

SPRINGS

Here are types of finish recommended for specific end applications

Conclusion of series . . .

FIRST TWO articles in this three-part series on springs discussed: materials from which springs are manufactured, design requirements, specifications and tolerances. This, the concluding installment, has to do with finishes, more about uses, and packaging.

By
CHARLES O'HARA
Assistant Manager at the San Francisco plant of Connor Spring Mfg. Co.

THE MAJORITY of springs are manufactured of Carbon Steel wire and, therefore, obtaining a corrosion resistant coating becomes a common problem. The oil film imparted to the wire during coiling and subsequent handling is sufficient to inhibit corrosion in normal atmospheres for short periods. This film, however, will be burned off if the springs are relieved of stress by heating after coiling. Where it is felt a protective coating is required due to corrosive atmospheres, the following finishes are commonly used:

Finishes

(1) *Rustproof Dip*
Many rust preventive compounds are available for temporary protection during shipment and storage. These are applied by dipping. Examples are oil, oakite, etc.

(2) *Black Japan*
A semi-flexible, inexpensive paint finish. Not generally recommended for mechanical springs because of tendency to chip off during handling and operation.

(3) *Cadmium Plate*
An electroplated deposit, generally about .0003 in. thick. This is the most common finish where best possible corrosion resistance is required on carbon steels.

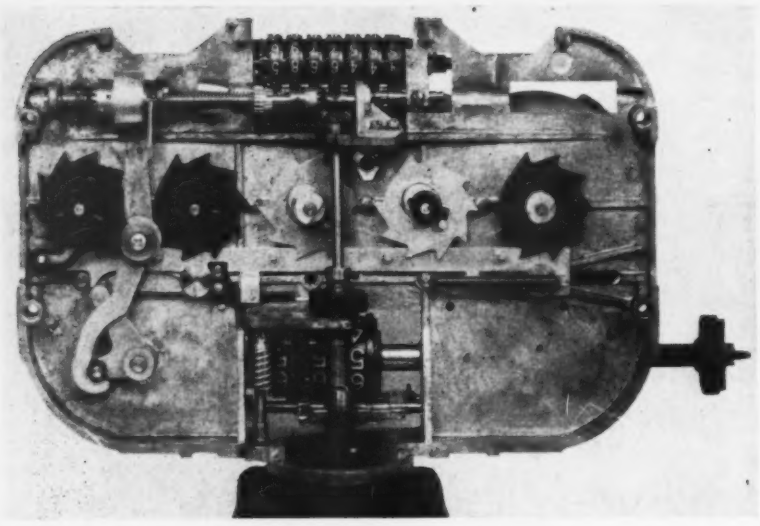
(4) *Zinc Plate*
Electroplated, similar to cadmium. Slightly less resistant to corrosion than cadmium, but also slightly less expensive.

(5) *Phosphate Coating*
Parkerizing, Dulite, etc., are chemical coatings applied by dipping in a hot solution. Inexpensive, but not as corrosion resistant as cadmium and zinc unless oil coated. The oil coating is found objectionable in some applications where it may rub off. Phosphate coating has the advantage of not being as subject to hydrogen embrittlement as plated finishes. (See below.)

While cadmium and zinc plating are probably the most satisfactory finishes for springs from the standpoint of corrosion resistance, they must be applied carefully as electroplating subjects springs to a condition known as hydrogen embrittlement. This is a penetration of the metals crystalline boundaries by hydrogen ions and/or atoms. Hydrogen embrittlement has an ultimate effect similar to "solution cracking" and "age hardening." It can embrittle springs to the extent that fracture will occur due to internal stresses only, with no external loads applied. Investigations conducted thus far are not conclusive. However, the following facts have been determined:

1. The more dense and homogeneous material surfaces offer the

ANOTHER WESTERN product, Ampex Electric Co.'s 400-A recorder, makes use of precision springs for its reliable performance.



CUT-AWAY VIEW of the Brodimatic Quantrol Counter—a product of the Ralph N. Brodie Co. of Oakland. A total of twenty-seven springs are put to use in this one machine. The springs vary in size and shape, except for those used to move the counting dials. These springs are similar in size and appearance but different in load factors so they are dyed different colors at the Connor plant to simplify assembly of the meters.

greatest resistance to embrittlement. Hard drawn wire is less susceptible than drawn and tempered wire. Thus Music, MB and HB wire are safer to plate than Oil Tempered wire.

2. Pickling (acid cleaning) of springs prior to plating can in itself cause embrittlement.

3. Baking the parts immediately after plating, usually at about 375° F. for 2 hours, will drive off the nascent hydrogen and decrease the possibility of embrittlement.

4. In practice, embrittlement trouble occurs with Oil Tempered wire with much greater frequency than with other spring materials.

5. Shotblasting of springs prior to plating decreases the chance of embrittlement.

Many other plated finishes such as Nickel, Chrome, Lead, Brass, etc., are available. They are not generally justified except where required to harmonize decoratively with other parts.

With regard to plating it should be recognized that close coiled springs will receive little or no plating on the inside of the coils and where coils are in contact unless the expensive procedure of stretching each spring during plating is used. For such springs, "coated wire" is often used. This is wire to which a coating has been applied electrolytically or by emersion and wiping at the wire mill. This wire will, of course, not be coated on the cutoff ends. Your springmaker should be consulted if you have close wound springs where full plating inside coils is essential.

Vibration

In certain applications where the spring is acted upon by a fluctuating load, premature failure or unsatisfactory operation will occur seemingly without reason. Many times these troubles can be traced to vibrational effects. The spring is an elastic body with its own natural frequency of vibration and harmonics thereof. There are, therefore, a series of frequencies which, when acting upon a given spring, will cause "floating," "over-oscillation" and other disturbing phenomena. Where spring trouble is encountered in rapidly oscillating mechanisms an analysis should be made of the vibrational characteristics of the system after checking for obvious causes of trouble in mounting, spring stress, etc. Here the springmaker's specialized experience can usually offer the best solution to the problem.

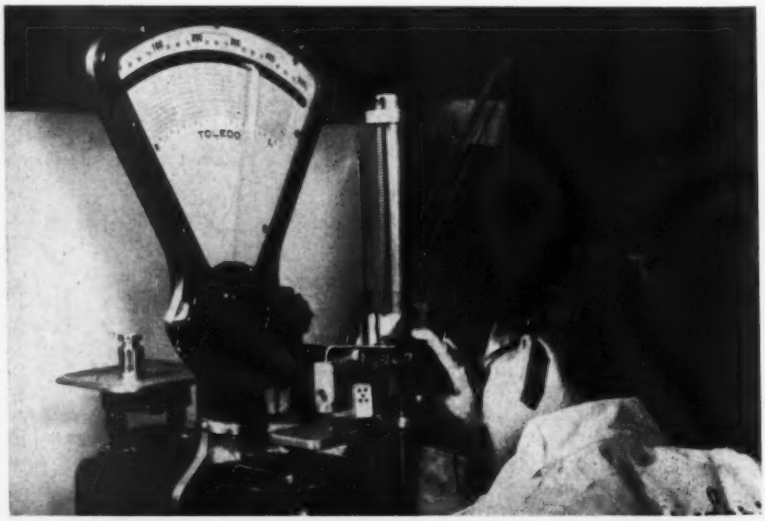
In some applications two or more springs of slightly varying characteristics may be used in parts such as valves, instruments, etc. In these cases where the physical dimensions are nearly identical but load characteristics vary, it becomes important to identify the springs so that they will not be inadvertently mixed. Various finishes such as flexible enamel, dyes in special vehicles, etc., can be used to "color code" such springs for identification purposes. This process has simplified stock control and inspection in many applications.

In this and preceding articles, we have outlined the major factors to be considered in ordering springs:

1. Spring Form
2. Tolerance
3. Material and Finish

Because a number of variables enter into the design and manufacture of any spring, the user should make use of the specialized knowledge of the spring maker in his field. Spring manufacturing in the West has kept pace with the rapid industrial growth of the area during the past two decades. The spring user will find production facilities and technical help of the leading Western producers equal to those anywhere. Making full use of these local sources will provide the user with readily accessible technical assistance —often invaluable to the economical production of a product.

TOLEDO SCALE especially adapted for use in testing the compression capacities of precision springs.



Rome-Turney water-cooled condenser coil. Tube is ⅝" O.D., .042" ga., bent on a 1⅜" centerline diameter. Soldered helical fins are .135" wide, spaced 14 turns to the inch. Other types of heat exchanger coils are also shown. Rome-Turney forms coils out of tube up to 40 feet long, without joints.

For Copper Tube that can be BENT

Rome-Turney sees REVERE

Most of the Revere Metals are fabricated by usual methods into conventional products. Some of them, however, appear on the market in forms that are unusual and possess special advantages. Take these helical-finned copper coils produced by the Rome-Turney Radiator Co., Rome, N. Y. It takes extra skill to produce coils with such small radii. The company can produce the coils shown on a commercial basis, for use in air conditioning apparatus, air compressors, and general heating and cooling applications where compactness plus high heat transfer rates are essential.

How it is possible to make such tight turns is Rome-Turney's secret. Revere does not share in it, nor does Revere want to reveal a secret of its own, which is how we turn out copper tube in a special bending temper for an application such as this. All we can say is that the two methods dovetail very nicely. If you need copper tube that can be bent easily, and offers you as well the advantages of corrosion resistance, high heat transfer, easy joinings, see Revere. We also make copper pipe, tube in copper alloys, aluminum alloys, and electric welded steel tube. If required, the Technical Advisory Service will gladly collaborate with you, as it has with Rome-Turney, on selection and specification matters. Get in touch with the nearest Revere Sales Office.

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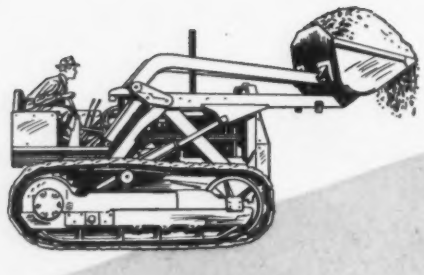

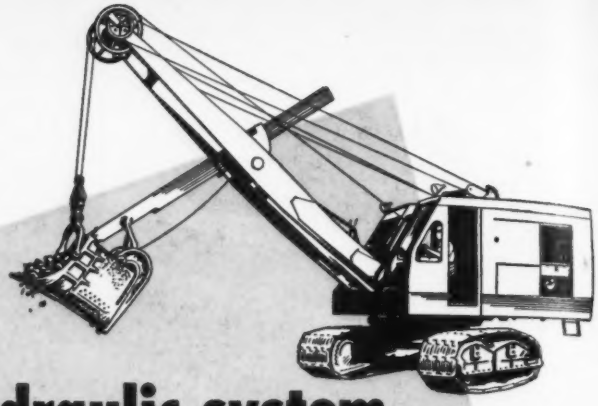

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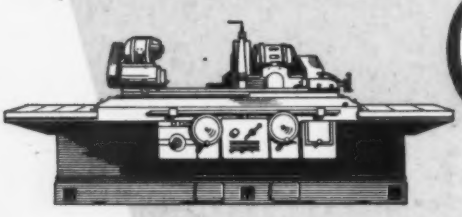

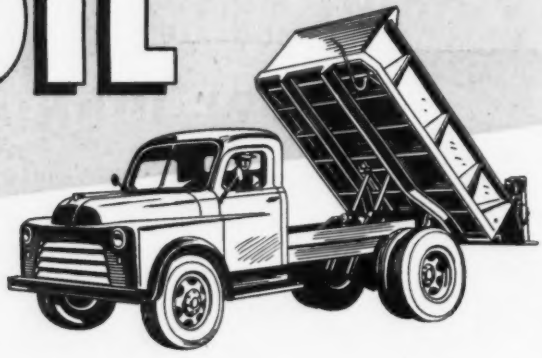

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SHELL

BULK HANDLING TREND works out excellently in milk

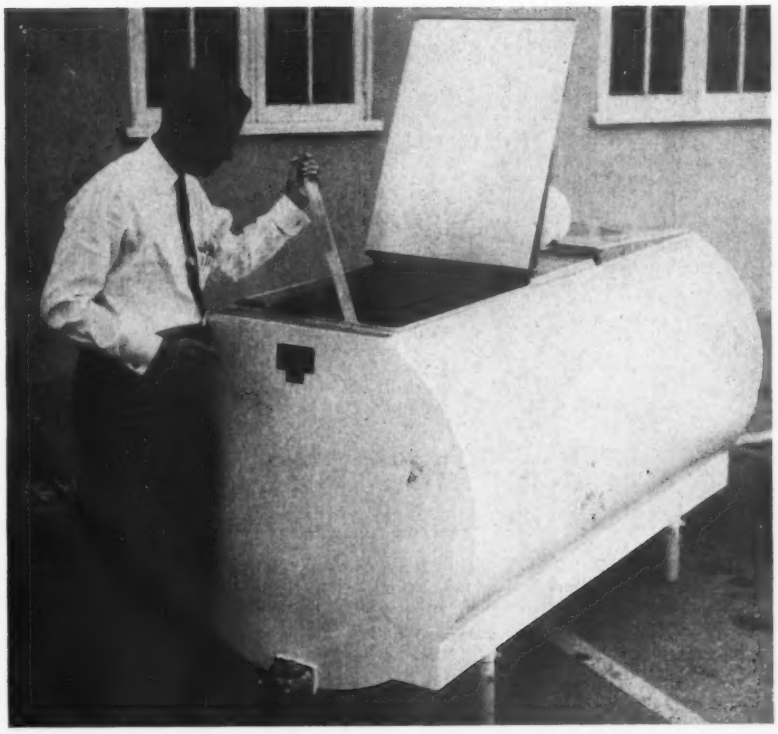
Southern California dairies eliminate 10-gallon milk can in five years, and its farm vat system spreads all over the country

By
GEORGE E. MORTON
Field Superintendent
Arden Farms Co.
Los Angeles

IN NOVEMBER of 1946 a stainless steel milk vat of 1,500 gallon capacity was installed on a large commercial dairy near Los Angeles. As the milk was drawn from the cows it was pumped into this vat where it was refrigerated and stored for shipment by road tanker.

This was the small beginning of the fast growing movement that succeeded in converting Southern California milk hauling to 100 per cent farm vat operation in less than five years. The economies and numerous advantages of this system of bulk milk handling have been so well demonstrated in this area that it is rapidly being developed in a great many of the milk producing areas throughout the United States.

Elimination of the familiar 10-gallon milk can from the dairy scene in Southern California was only one of the many advantages gained by adoption of the bulk handling system. Some of the very favorable items of advantage here listed were not fully apparent when initial exploration was instituted.



MEASURING the volume in a cylindrical farm vat (made by C. E. Howard Company) with a stainless steel dip stick gives determination accepted by state authorities.

Advantages of New Method

1. Decreased transportation costs from country dairy to city processing plant.

2. Positive control of milk temperature from time of milking until delivery to processing plant.

3. Lower storage and delivery temperatures have greatly improved quality from a bacteriological standpoint.

4. Complete mixing of the production of each dairy herd has eliminated rancidity problems.

5. Loss of butterfat and milk at point of production and in transit has been reduced to minimum.

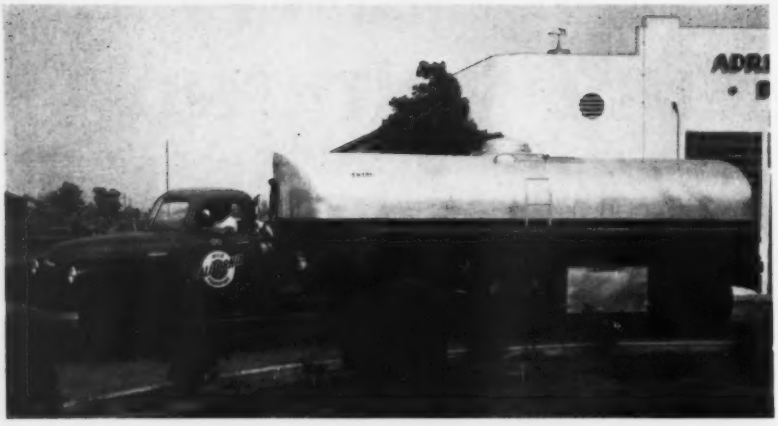
6. Weighing (measuring) and sampling operations are conducted at the dairy, which has immeasurably increased the producers' confidence in the accuracy of the procedure.

7. The producer is enabled by this system to more closely follow daily herd production and to easily run sample checks on the butterfat content.

8. Transportation companies are enabled to retain their older and most reliable drivers far past the age at which the physical requirements of the old system would have forced retirement.

9. Sharper line of division on equipment sanitation, in that the producer no longer uses the 10-gallon can sanitized by the processing plant.

10. Very marked tendency for level production throughout the year. Be-



2800-GALLON Heil stainless steel tanker, equipped with pump for loading milk from the vats, cuts down cost of transportation from country dairy to city processing plant.

METHOD OF PUMPING milk from vat into tanker. New system provides positive temperature control from time of milking until delivery is made at processing plant.

cause daily production above farm vat capacity creates problems, the average producer tries to hold spring production within vat limits. Division of the curtailed Fall production is not accomplished as easily as it was in the days of can shipment; besides the producer strives to keep the farm vat level somewhat near capacity in even the short season.

11. Modernization of all other milk production equipment at time of farm vat installation and better maintenance of all equipment because of farm vat use. Tinned copper for dairy equipment has been practically eliminated, and this one factor has considerably decreased milk oxidation difficulties.

12. A very marked tendency towards fewer and better dairy operators, due to increased total investment in dairy equipment and also because the producer of inferior quality cannot survive under the far more rigid requirements demanded by bulk shipment. The initial cost of remodeling for and installation of bulk equipment favors longer dairy leases and increases incentive for ownership of dairy property.

13. A total better quality of milk is produced because the occasional unscrupulous producer, who in previous times was tempted to send in a few cans of off-quality milk in the hope that it would slip by the plant receivers, is afraid and rightly so, to add this off-quality milk to the large amount of good milk in the farm vat.

14. Dairy milkhouse sanitation is much better because of elimination of the large amount of floor traffic necessary in loading and unloading 10-gallon cans. Fly problems in milk houses have been decreased for the same reason. Milk house floors remain smooth and clean, while walls and doorways no longer receive their former twice-daily battering. Empty and full cans stacked on the milk house floor were a real obstruction to complete sanitation.

15. Material labor savings have resulted in three parts of the dairy industry: production, transportation and the receiving departments of the processing plants. While it is true that the producer has additional equipment to wash and sanitize, the labor involved is much less than formerly required to handle cans. The efficiency of the transportation end has nearly doubled and the labor necessary to receive and wash containers at the receiving department has greatly decreased.

16. A definite saving is effected in shipping container depreciation, maintenance and repair.

Disadvantages Listed

Naturally, there are certain advantages inherent to the old method of handling milk in 10-gallon cans, and the loss of these advantages is most apparent at time of converting to bulk handling. However, the slight economic and quality advantages are heavily outweighed by all of the advantages accruing to bulk handling.

To be entirely fair, we are listing herewith some of the major disadvantages encountered in bulk handling:

1. Higher initial cost of a producer becoming established in the production of milk.

2. The limiting of dairying activities to a fairly concentrated area, due principally to highway conditions.

3. Loss of some flexibility in the transportation end. The old can truck could always accommodate a few more 10-gallon cans, especially in the flush season. Also, the can truck could operate with greatly decreased load without endangering the physical equipment.

4. When spoilage does occur, whether through accident or carelessness, the value of the product involved is great and possibilities of multiplying the original damage are somewhat greater.

5. The transference of a large part of the duties of the small group of highly trained milk men in the processing plants who performed the receiving, weighing, grading, butterfat payment sampling and quality sampling to a much larger group of men who are primarily employed for their abilities as road tanker drivers. This factor tends to limit the size of the group from which milk transportation employees can be selected.

Continued on page 60

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BULK HANDLING

. . . Continued from page 58

6. Cost of inspection by health authorities is somewhat increased by the fact that samples for analysis must be picked up at the individual dairies as well as from the receiving departments.

7. Bad weather or other adverse conditions demand quite heavy investment in auxiliary equipment by the producer and transport hauler.

8. Extension of the duties and consequent heavier expenses incurred by the governmental departments responsible for accuracy of weights and measures.

9. In general, a substantially higher laboratory cost by the processor.

10. A general lowering in milk quality, not below legal standards, could ensue in a milk supply, if a vigorous educational program is not pressed constantly by all interested parties with both producer and hauler.

With but minor exceptions, all of the enormous daily volume of Grade A milk in California is cooled by direct-expansion refrigeration. This system of cooling milk for can shipment had been in successful use in the area for a great many years, and it was therefore logical to merely change the storage container from 10-gallon cans to farm vats ranging in capacity from the small 200-gallon size up to 3,200-gallon.

Two Systems Used

Very early in this farm vat program two systems were evolved, both of which proved highly satisfactory, and each having advantages and disadvantages. A brief description of each would be enlightening, especially in view of the fact that the farm vat program may ultimately become nation wide.

The refrigerated farm vat is fabricated in various sizes and shapes, the two most popular shapes being cylindrical and rectangular. The inner lining of these vats is made of highly polished 16-gauge dairy grade stainless and is designed to avoid sharp corners and crevices.

Direct-expansion refrigeration is applied against the outside surface of this inner lining in various ways. Some manufacturers weld formed stainless steel to the outside of this vat lining, so that the lining itself forms one wall of the expansion tubing surface, while other manufacturers simply bind a seamless tubing of steel or copper tightly against the outer surface of the vat lining.

Insulating material, most commonly two inches of cork, is applied over the outside of the inner liner and the whole encased in a stainless or mild steel jacket. The refrigerated surface area varies according to the engineering ideas of each manufacturer, but by trial and error it has been found that the refrigerated area must be so extended that some part of it is in contact with the milk at all times, whether the volume present is one gallon or 2,000 gallons.

Refrigerated vs. Non-refrigerated

The refrigerated farm vat has two main advantages over the non-refrigerated but equally well constructed insulated holding vats. They are as follows:

1. Cooling and storage within one easily sanitized vessel and at a working level for ease in cleansing and sanitizing.

2. Refrigeration of the product can be extended beyond the time of actual milking operations, if necessary.

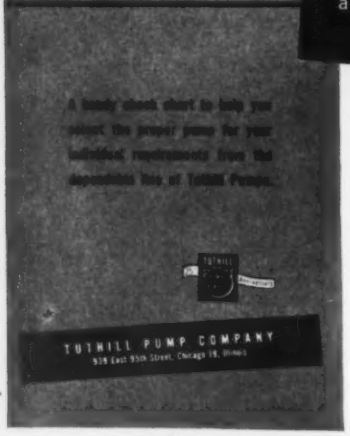
The non-refrigerated insulated holding vat is constructed exactly as the refrigerated vat with the exception that no provision whatsoever is made for refrigerating any of the interior surface of the vat.

It has two main advantages, which are that it is lower in original costs and costs less to maintain. Its one main disadvantage is that cooling equipment, meaning surface cooler, must be above vat inflow, and this means raising entire herd production by one means or another to the additional height every day of the year.

Concluded on page 62

When You Need Pump Replacements...

TUTHILL PUMP GUIDE



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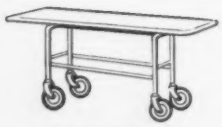
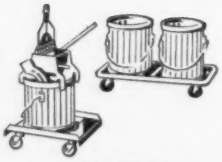

WHEEL STRETCHER & HOSPITAL EQUIPMENT

DISH TRUCK


MOP TRUCKS

HAND TRUCK DRUM TRUCK

FOR GENERAL USE FURNITURE TRUCK KEG TRUCK

TRUCK Selection Chart

CANVAS BAG TRUCK

TANK TRUCK

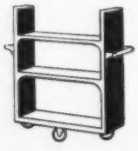
PLATFORM TRUCKS

BOX OR CRATE DOLLY MILK CRATE DOLLY

REFUSE CAN DOLLY PIANO DOLLY FURNITURE DOLLIES

LINEN SERVICE TRUCK

MARKING TABLES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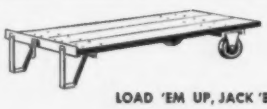
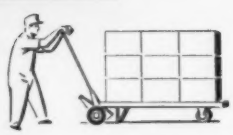
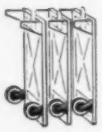
"LIFT JACK" MATERIAL HANDLING SYSTEM


LOAD 'EM UP, JACK 'EM UP AND ROLL




STACK 'EM UP

BULK HANDLING

. . . *Continued from page 60*

Several methods of accurately measuring the volume of milk in each farm vat have been explored over the past six years and the majority opinion finally crystallized upon the dip stick method. A stainless steel rectangular measuring rod, inscribed in inches subdivided into thirty-seconds of an inch, is provided with a firm vat mounted socket.

When the vat is installed or position changed after installation, the vat is carefully calibrated by water against the measuring stick readings. The results are tabulated on charts for use by the licensed weigher-sampler-road tanker driver on each pickup of milk made from the vat.

The California State Bureau of Weights and Measures has instituted a system of checking the accuracy of the farm vat as a measuring vessel and it is quite generally conceded by the Bureau, and the buyers and sellers of milk, that the methods of measuring are accurate and practical.

A large part of the admitted success of the farm vat program, and in particular the refrigerated farm vat program here in Southern California, can be attributed to our dairying methods. These can, in turn, be credited to our climatic conditions.

We have proved beyond any shadow of doubt that milk produced from properly fed cows, milked in the California type barn (comparatively open air), can be cooled in an entirely enclosed refrigerated farm vat, without the necessity for aeration over an exposed surface cooler.

In 1947, when the big impetus towards the farm vat program got under way, we were very fortunate in having in this area a number of dairy equipment manufacturers highly skilled in stainless steel fabrication, and as a result the first vats installed are performing just as efficiently now as the 1952 models.

It was quite natural that various refinements would ensue during the five-year period and this year's farm vat has better appearance as a result. The farm vats manufactured for, and time proven, in this intensive dairying area are now being turned out in ever-increasing numbers for users in most parts of the 48 states and a good many foreign countries.

The end result of a better product for the consuming public, with a total lowered labor cost in milk products, certainly augurs well for the future of the farm vat program on a national basis.

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Keyless Drill
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DIE SETS
DIE SINKERS
DRILLING & TAPPING MACHINES
FINISHING MACHINES
Precision
FORMING & CUTTING-OFF MACHINES
Automatic
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PRODUCTION AREA at Hanford Works where plutonium is manufactured by the transmutation of uranium. There are a number of these self-contained areas on the 620 sq. mi. reservation. The AEC has earmarked another $411,000,000 for expansion at the huge plutonium factory.

ATOMIC ENERGY—

Hanford buys in a big way, but "specs" are tough

EXPANSION of the atomic energy plant at Richland, Washington, amounting to around $411,000,000 is about to begin. It has been chronicled in the press, but little has been said about the effect this expansion or expenditure will have on industries in the eleven Western states.

Originally, this plant, built during World War II, cost $350,000,000. Since then, another $350,000,000 has been spent on modernization and expansion. With this added $411,000,000 coming up, the grand total will run into 1,111,000,000. Shops and mills up and down the West Coast have felt the impact of atomic energy dollars before, and they are about to feel it again.

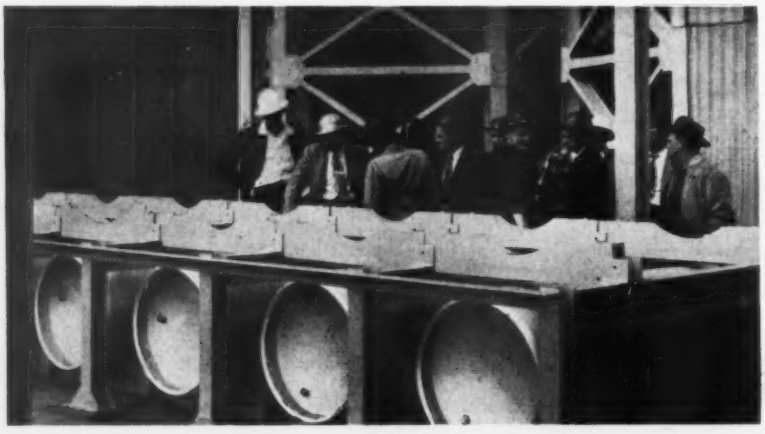
Purchasing policy at Hanford Works is to buy "local," when possible. For a project of this size, the term "local" includes all of the region West of the Rockies. Many of the contracts included in this $411,000,000 expenditure will be awarded to readers of *Western Industry*.

This all adds up to a big job for the 25 to 50 man staff of engineering inspectors General Electric Company keeps in the field to inspect Hanford Works purchases. These men are responsible for inspection of all engineered materials and equipment purchased for the project—whether the purchasing is done by G.E. which operates the plant as prime contractor to the Atomic Energy Commission, A.E.C. construction contractors, or the A.E.C. itself.

How expensive is an atomic energy plant?

TAKING this one plant, the Hanford Works, as an example, its total cost (including this last announced expansion) will amount to around $1,111,000,000. If that amount of money should be charged off to the residents of these eleven Western states, population around 19,000,000, (we'll let the Easterners pay for Oak Ridge and Argonne), we find that *every individual in this area* would have to produce around $58.50 to pay for it. That includes all the men, all the women, and all the children.

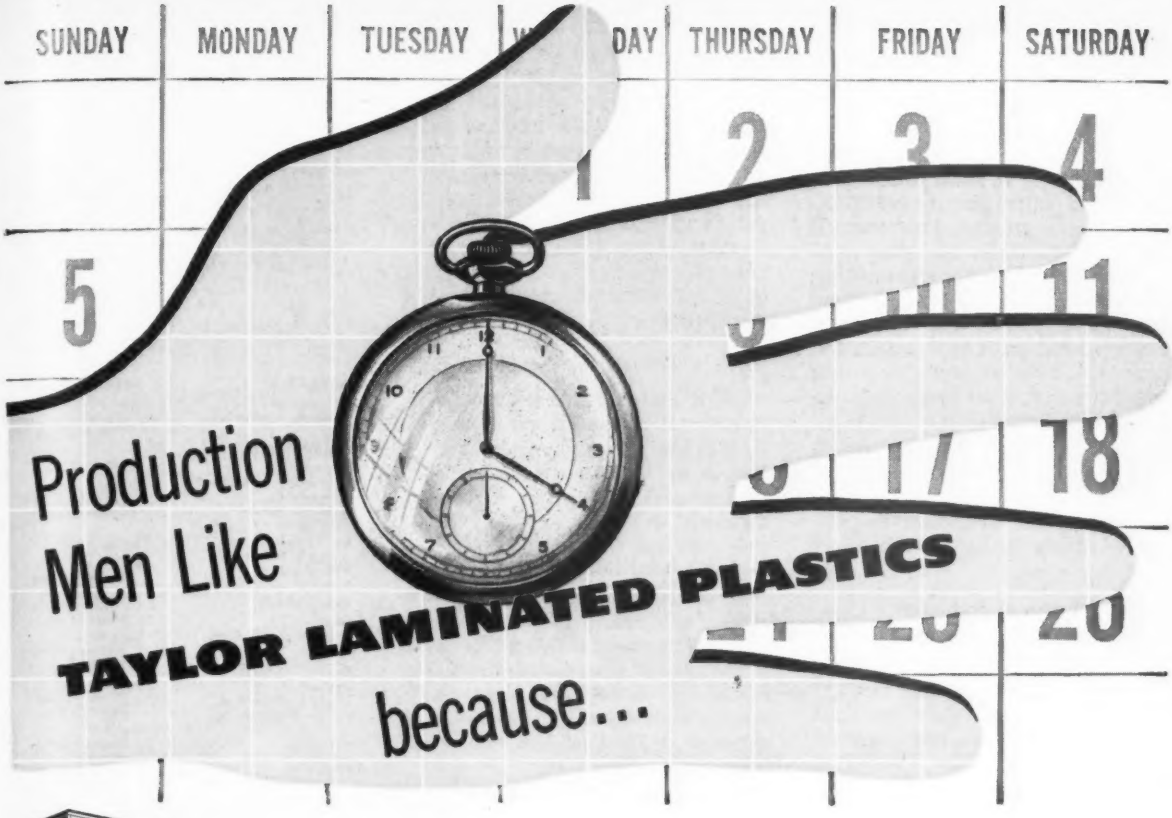
A FIELD TRIP during the recent inspector's conference series at Richland gave the men a chance to see some of the equipment they inspected before purchase. West Coast firms fabricated a large amount of equipment like this.



Conferences

To prepare the engineering inspectors for the big job ahead, they were recently called together for a series of conferences in Richland, where the

Continued on page 66



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ATOMIC ENERGY

. . . Continued from page 64

Hanford Works administrative and engineering offices are located.

The men were given a fairly detailed summary of what will be purchased and built during the $411,000,000 expansion program. Engineers and scientists who design and plan separation plant and reactor explained the requirements that result in the demand for high standards. They explained why construction is kept only a few steps behind design, even though this sometimes results in last-minute design changes.

The inspectors were also brought up to date on G.E. policy and were taken through the plants so they could see some of the equipment they inspected during the last expansion program.

Cause of Problems

During the conferences, time was reserved for them to discuss among themselves and with Hanford management, the problems they run into. Members of the engineering inspection staff located on the West Coast have found that the relative youth of the area as an industrial region is the biggest cause of problems for them.

Some suppliers in the last expansion program experienced difficulty in complying with drawing and specification requirements.

After submitting a bid and being awarded the contract, vendors occasionally discovered they had not properly interpreted the specifications, and the discovery raised the cost of the job. In an effort to make money on the contract in spite of the oversight, they tried to reduce costs on other parts of the job . . . and the resulting rejects increased their difficulties.

Attention to Details

Some vendors felt that the G.E. inspectors were too stringent in holding them to the letter of the specifications. But in an industry that deals with dangerous chemicals and radioactive materials, attention to details is the only rule that can provide the necessary margin of safety.

This new expansion program will require tremendous quantities of materials. For example, one of the parts of the job will require enough concrete to build a sidewalk four inches thick and of standard width all the way from the plant at Richland, Washington, to San Francisco.

But quantity is not the whole story. Hanford Works is an unusual plant. It manufactures plutonium for the atomic energy program, and the processes involve materials unusual to the West Coast in large quantities—such as materials that are highly radioactive, poisonous, or corrosive.

This means that during a construction job at Hanford, some of the equipment and construction materials purchased sound strange to West Coast manufacturers and processors. In looking over a list of things to be bought over the coming two years, you will run across some strange items. 120,000 pounds of ⅜ in. chrome plated, precision steel balls; 70 carloads of cast iron blocks; 200 carloads of steel punchings for concrete aggregate; some of the biggest pumps of their type in the world; vessels designed around the railroads' maximum limits (the largest that can fit in Western tunnels when loaded on lo-boy rail cars).

Buying in big quantities and buying unusual items is complicated by the rigid standards that have to be maintained.

Close Inspection

There is a little matter of 60 odd miles of specially formed aluminum tubing, for instance, that will have to be examined, inside and out, over every foot of its length. The steel balls

Concluded on page 68

SOME of the equipment purchased for Hanford's last expansion program. Big pump was designed to meet special requirements.

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ATOMIC ENERGY

. . . Continued from page 66

mentioned above will be simpler—only 1% of them have to be inspected. But even that means that 180,000 of those little spheres will be picked up individually and inspected.

All welding on process equipment will be x-rayed, and an extremely rigid interpretation of applicable welding codes will be applied.

Standard Specifications

Wherever possible, standard specifications are applied in purchases for Hanford. In many instances, there is no applicable standard. For example, there is no American standard for remote handling equipment, so Hanford Works had to draw up its own specifications. However, standard codes are included in these specs wherever possible.

On the whole, inspectors are confident that their jobs will run more smoothly during this expansion than last time. They and the vendors understand each other better now, and West Coast suppliers have learned a lot about what is required of them when they are producing for the men who build atom plants.

QUALITY CONTROL BY SAMPLING
shouldn't be confused with sorting

STATISTICAL SAMPLING should not be confused with the job of sorting, it was brought out at the November meeting of the Seattle chapter, American Society for Quality Control. Sampling determines the quality level of a lot of the product involved, and does not separate good items in a lot from bad ones.

A panel discussion on sampling inspection by Paul Burdett and Robert Phelps of the Air Force and Gordon Campbell of Boeing brought out the following points:

The fallacy of straight percentage sampling of lots was demonstrated by drawing colored beads from a bag. It was shown that in lots of the same quality level but varying in lot size—all sampled at 10 per cent of the lot size—the smallest lot (20 items) was accepted almost all of the time; whereas, the largest lot (300 items) was rejected most of the time.

All lots had a quality level of ten per cent defective. From this it was wryly commented that a sharp vendor had best ship in small lot sizes where his quality level was in doubt and the customer used this unsatisfactory percentage sampling system.

A well designed sampling plan must exist both on the part of the vendor and the customer. The vendor and the customer should be acquainted with each others' sampling systems so that their results will be compatible, for in statistical sampling the customer is taking the risk that he is accepting lots below the specified quality level, and the vendor is taking the chance that lots of specified level or better may possibly be rejected and returned to him.

For this reason the standard sampling system in use by the military is outlined in Mil-Std-105A dated 11 September 1950 and titled "Sampling Procedures and Tables for Inspection by Attributes." Copies of this Military Standard may be obtained by individuals, firms and contractors from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Both the title and identifying symbol should be stipulated when requesting copies of this standard.

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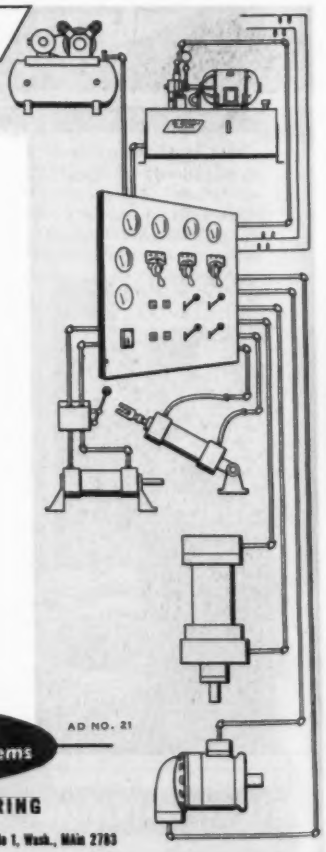

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Sheaffer's new Snorkel Pen created a sensation when it was introduced to the trade. Using air alone, the pen is emptied, cleaned and refilled through the filling tube of the Snorkel Pen with a one-stroke touch-down action.

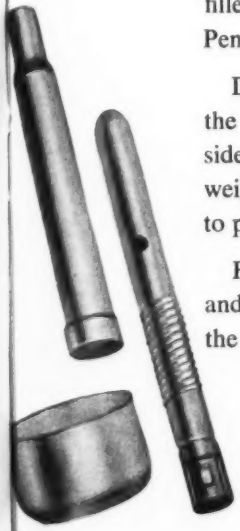
Designing the two brass "lungs" comprising the plunger-siphon mechanism called for considerable ingenuity. They must be light in weight, stiff and strong, easy to form and easy to polish and plate.

Formbrite* met all of these requirements—and more. With a metal thickness of only .0058", the 2" long cylinders are formed in multi-plunger presses in eight successive operations—*without annealing of any kind.*

Formbrite's superfine grain resulted in a harder, stronger, longer-lasting product with savings up to 50% in polishing costs.

Surprisingly, Formbrite, with all the plus values it offers over conventional drawing brasses, costs no more. See the reverse page for another application of Formbrite. And write for Publication B-39, addressing The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario, Canada.

*Reg. U.S. Pat. Off. 5295



Cups like this, blanked and formed in one operation from Formbrite strip 1 11/16" x .0058", are magazine-fed into multi-plunger presses. Eight successive operations produce the sleeves illustrated at top of page *without annealing*. Sleeves at left are finished, ready for chromium plating.

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Timestudies made of finishing operations have shown that a bright, lustrous finish can be obtained by a simple "color buffing" operation in half the time previously required.

That's why we say you can do it *better, cheaper and faster* with Formbrite. Millions of pounds of Formbrite sheet and strip have been produced and economically fabricated into hundreds of different products. Want a sample—and more information? Address The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario, Canada.

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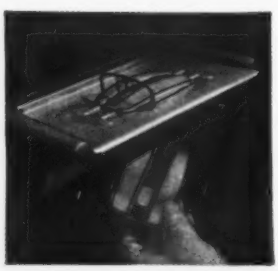
In the pressroom of a supplier, the back of a military brush is blanked from Formbrite red brass strip.



Empire Brushes, Inc., Port Chester, N. Y. produces an extensive line of military and clothing brushes with Formbrite components. At right, a decorative band is being applied.

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LEARNING CURVE

. . . Continued from page 49

days became a shout on the seventh and eighth.

Yet no action was taken until she solved the problem herself by resigning after 15 months' employment.

The extent of potential loss had she not quit, is emphasized by a comparison of the estimated number of items that she would have produced in ten years, which is less than half the average of the three others. This means that, if we were to compile the cost of this single case of bad placement, we would start with half her base pay. To this we would add the cost of an unusual amount of supervision, of machine inefficiency if not frequent breakdowns and of spoiled materials.

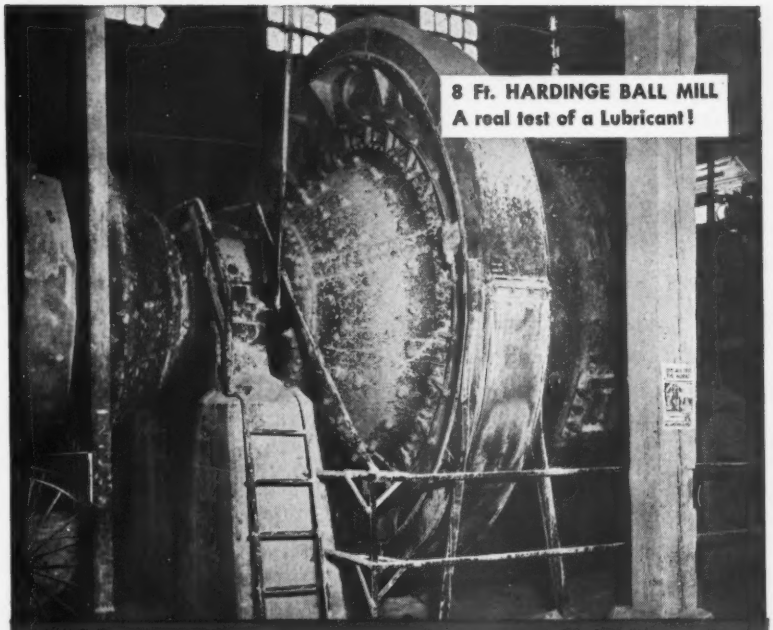
Trends of learning curves of individuals are seldom as firmly established as this one as early as the seventh day. Among the 34 data examined recently, on the other hand, there is no instance where the idea occurred to any person of using it as a more easily understood method than the equation of presenting the phenomena. Time did not then permit developing like series of figures for other workers. This was a significant reversal of the conclusions we would have drawn on the 20th day. It seems likely that fuller investigations will indicate that not over 30 days are needed to give a firm indication of the learning trend.

The interesting acceleration shown in Table 3, from four to six to 14 weeks, to three and then to 57 years as the period of time it will take to achieve a rate of .0009 hours per cycle, is more or less typical of the pattern of the failing employee, although the author has never seen it develop so rapidly and to the same extent in another person.

This phenomenon may reflect the effect of the loss of motivation through dribbling away of the enthusiasm of the new employee who finds his work uncongenial. Perhaps, if the drive of this employee could have been maintained at its first heat, she would actually have achieved a good level of production in a few weeks as first indicated by the learning curve.

Of course, some part of this loss of enthusiasm is in no way a fault of management. Many an employee is unrealistically optimistic when he enters on a new job. But sometimes, a condition of poor adjustment can be corrected by management if taken in time.

It is our thesis that the early detection of this condition is an essential part of our task in the total job of fitting the employee to his best place.



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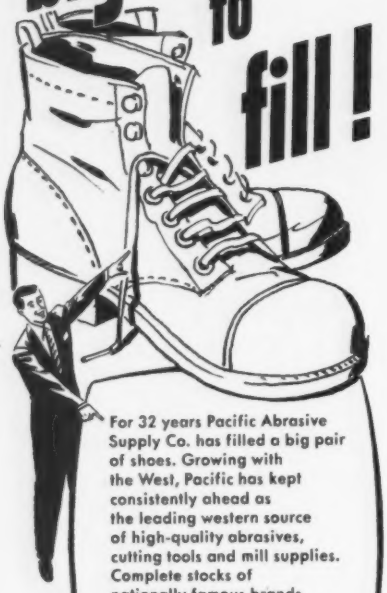

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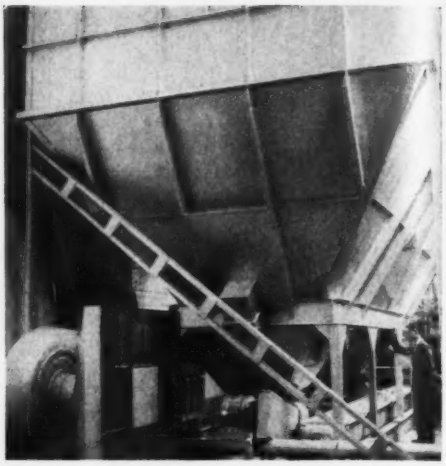

STORAGE BIN at C&H refinery holds 100 tons of bulk granulated sugar. Blower at left forces filtered air up through sugar to condition it so that it will not become lumpy or caked while in transit or in storage.

EQUIPMENT FOR BULK SUGAR at C & H's Crockett refinery

INCREASING quantities of granulated sugar are now moving to Pacific Coast industrial plants in the hoppers of highway trucks as a result of an installation at the California and Hawaiian Sugar Refining Corp. plant in Crockett.

Special Equipment for Bulk

Production and delivery of granulated sugar in bulk form call for special equipment at the refinery to condition the sugar so that it will not cake or become lumpy in transit or in storage at the food plant.

C and H's new installation does this conditioning by aerating the sugar as it comes from the refining process. Aerating is accomplished by forcing large volumes of filtered air through the sugar. Chief effect of this treatment is to remove the minute traces of moisture that cling to the sugar crystals as they emerge from the refining process.

About 400,000 lbs. of properly conditioned bulk granulated sugar can be produced daily by the $200,000 installation. It contains two 25-ton scale hoppers and a large storage unit with a capacity of 100 tons of sugar. Both storage and scale hoppers have aerating equipment.

Delivered in Hopper Trucks

Delivery of the conditioned sugar to industrial users is made in hopper type trucks which can carry more than 20 tons of sugar. Hopper type rail cars can also be loaded with bulk granulated sugar at the Crockett plant and will be used for delivery in states outside of California.

Unit was built to meet a growing demand from industrial users who favor use of granulated sugar in bulk form as a means of eliminating packaging costs and reducing handling.

Who and What

Hoppers and storage bins of this installation were made in Crockett.

Scales installed for weighing the bulk granulated sugar come from Fairbanks-Morse and Co.

Scroll conveyors and elevators used to move the sugar supplied by Stephens-Adamson Manufacturing Co. and Link-Belt Co.

Aerating blowers for sugar were furnished by Sturtevant division of the Westinghouse Electric Company.

HOPPER TRUCKS deliver bulk sugar from refinery to user. Trucks are loaded by gravity, emptied by tilting hopper.

TRADE PENETRATION of the Southwest

PENETRATION of the southwestern market by Los Angeles County firms has been accomplished only by careful and thorough work, according to M. J. Brown, domestic trade commissioner for the Los Angeles Chamber of Commerce.

Buyers Visited

One step has been to send representatives of the Chamber to visit personally the important buyers of various types of merchandise, and then give specific reports after each trip to local sales executives, unfavorable information as well as favorable. Specific opportunities for additional penetration are called to the attention of industrial executives.

Today's Distribution

Distribution in the southwest area now includes wide sales of apparel, furniture, cosmetics, gifts, foods, confectionery, automotive lines, machinery of various types, implements, hardware specialties, oil field equipment, marine and electrical supplies and equipment.

SPEAKERS LISTED for industrial institute

ADDITIONAL speakers for the UC LA session of the Institute of Industrial Engineering February 2 and 3 have been announced. This follows the session at Berkeley January 30 and 31, speakers for which were reported in the November issue of *Western Industry*.

Speakers and Topics

These speakers who will appear at Los Angeles only, and their topics, are as follows:

"Discovery Sampling: A New Approach in Inspection," James R. Crawford, manager, inspection technical services, Lockheed Aircraft Corp.; "Building Reliability into Complex Equipment Through the Application of Quality Control Procedures," Major General Leslie E. Simon, assistant chief of ordnance, United States Army; and "Time Reduction Curves —Introduction," H. W. Thue, works manager; "Mathematical Theory of Time Reduction Curves," B. I. Maynard, assistant to director of industrial engineering; and "Production Application of Time Reduction Curves," N. H. Shappell, manufacturing control, manager, all of Douglas Aircraft Company, Inc., Santa Monica, California.

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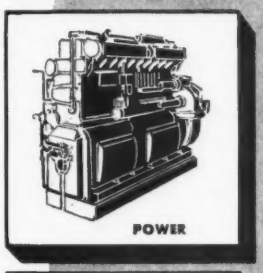

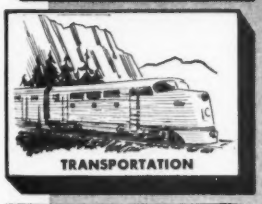

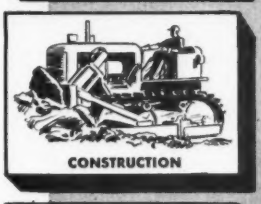

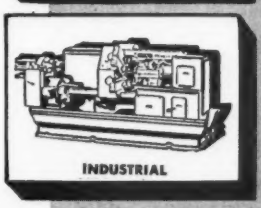

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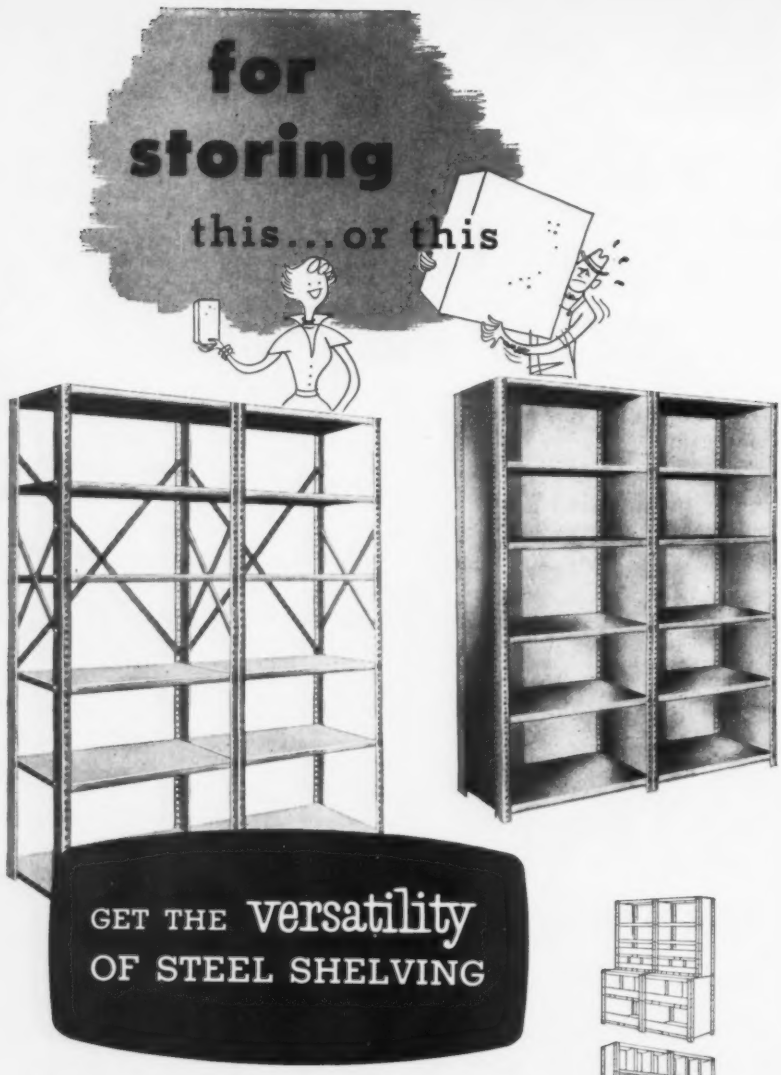

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EYE PROTECTION from worker's idea

AIR CLEANING of parts before assembly is a vital operation at the C. A. Norgren Co., manufacturer of pneumatic products in Englewood, Colo. Small metal chips and other foreign particles can seriously impair the performance of air line lubricators, air pressure regulators and other precision air control valves. So, air blow guns are used extensively in Norgren assembly operations to insure smooth flowing production.

The Idea

Through the company's employee suggestion system, an alert Norgren assembly worker named Eugene O'Mara submitted an idea that prevents eye injuries on air cleaning operations. He took one of the plastic baffle plates used on Norgren air line filters and attached it between the body and removable tip of a blow gun. The clear plastic plate not only deflects flying particles away from worker's eyes but it enables him to see the part that he is cleaning.

The Results

Eye injuries are prevented — there is no time out of production because of accidents from this source. And it is easier to install these plates on the blow guns than it is to persuade workers to put on goggles when air cleaning parts.

INSTRUCTORS NEEDED in communications

INSTRUCTORS are needed at the Southwestern Signal Corps Training Center, San Luis Obispo, in high-speed radio operation, field radio repair, fundamentals of electricity, power unit installation and maintenance, wire cable splicing, wire carrier and repeater systems, message center, manually operated central office switchboard, and teletype operation and maintenance.

Entrance salaries are $4,205 and $5,060. Applications should be sent to the Board of U. S. Civil Service Examiners, Southwestern Signal Corps Training Center, Camp San Luis Obispo, Calif.

How to Apply

Applications and additional information may be obtained from the civil service secretary at first- and second-class post offices, or from the office of the Director, Twelfth United States Civil Service Region, 630 Sansome Street, San Francisco.

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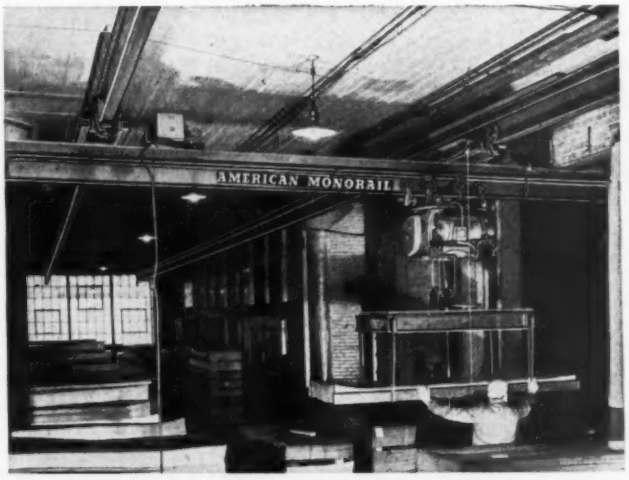

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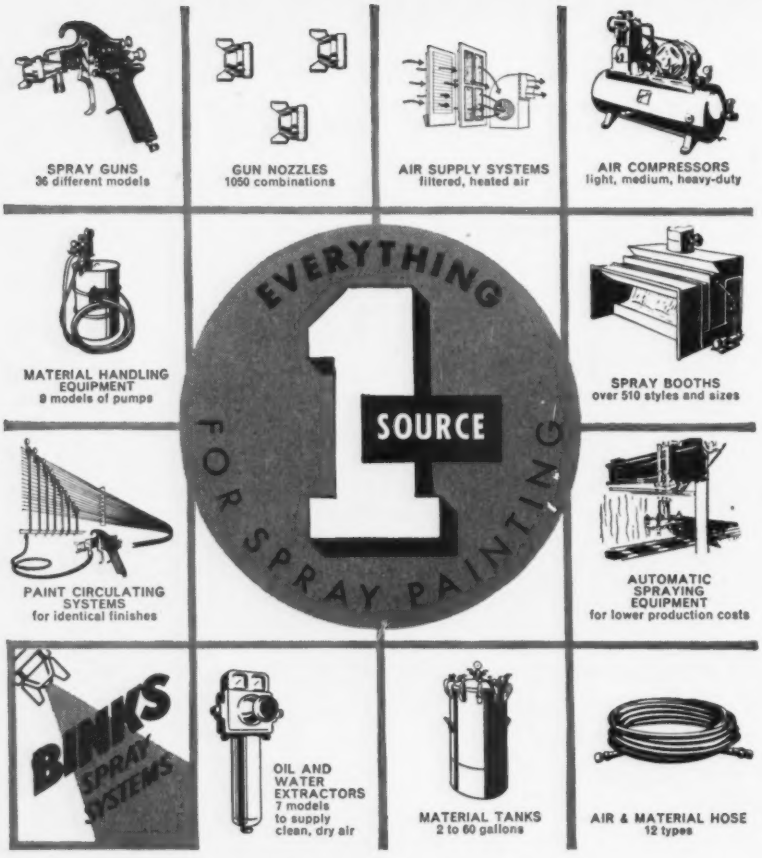

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BOOKS FOR INDUSTRY

Info on fastener standards

A 256-page book entitled "Bolt, Nut and Rivet Standards" is released by *Industrial Fasteners Institute*. It contains all current standards for commercial fasteners. The $3.00 book is published both to aid production in manufacturers' plants and as a service to users in acquainting them with accepted standards of nomenclature, dimensions, sizes and other practices. Requests go to Industrial Fasteners Institute, 3648 Euclid Ave., Cleveland 15, Ohio.

For those interested in petroleum products

A "Petroleum Dictionary and Products Manual," published by *Educational Institute of Los Angeles*, and selling for $8.00, should be of value to buyers, sellers, consumers and salesmen of petroleum products. The 502-page book contains 6,164 entries and 2,113 illustrations, and gives information on the fundamentals and application of petroleum products as well as definition of terms. Write to Petroleum Educational Institute, Dept. E, 9020 Melrose Avenue, Los Angeles 46, California.

Here's know-how about running a metal working shaper

South Bend Lathe Works has issued a handy volume designed to be a manual for the South Bend 7-in. shaper, entitled, "How to Run a Metal Working Shaper." It thoroughly covers set-up and operation of the metal working bench shaper. The 32-page handbook, selling at 25c a copy, contains over 65 photos and diagrams. Copies obtainable from any South Bend distributor or from South Bend Lathe Works, South Bend 22, Indiana.

Tool instruction manual

Warner & Swasey Co. publishes a 234-page booklet on its 5-spindle automatics, covering both bar and chucking machines. Book, which analyzes a wide variety of subjects under the general headings of machine construction, installation, attachments, tooling and operation, should be of interest to operators, setup men, maintenance men, production supervisors and managers. Price is $5.00. Order from War-

ner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

Radio and television analysis of the greater Phoenix area

Bureau of Business Services, Arizona State College, has prepared a radio and television analysis of the greater Phoenix area. Copies sell for 25¢ each. Send requests to Bureau of Business Services, Arizona State College, Tempe, Arizona.

NORTHROP-ANAHEIM'S Giant "Checkerboard"

ENTIRE AREAS of machinery can be moved like checker pieces from one square to another on the large plant layout board devised and constructed by technicians at Northrop Aircraft's Anaheim division. One glance at the planning board tells location of each piece of equipment in firm's production shop and contemplated moves can be tested out prior to moving actual machinery.

The Set-up

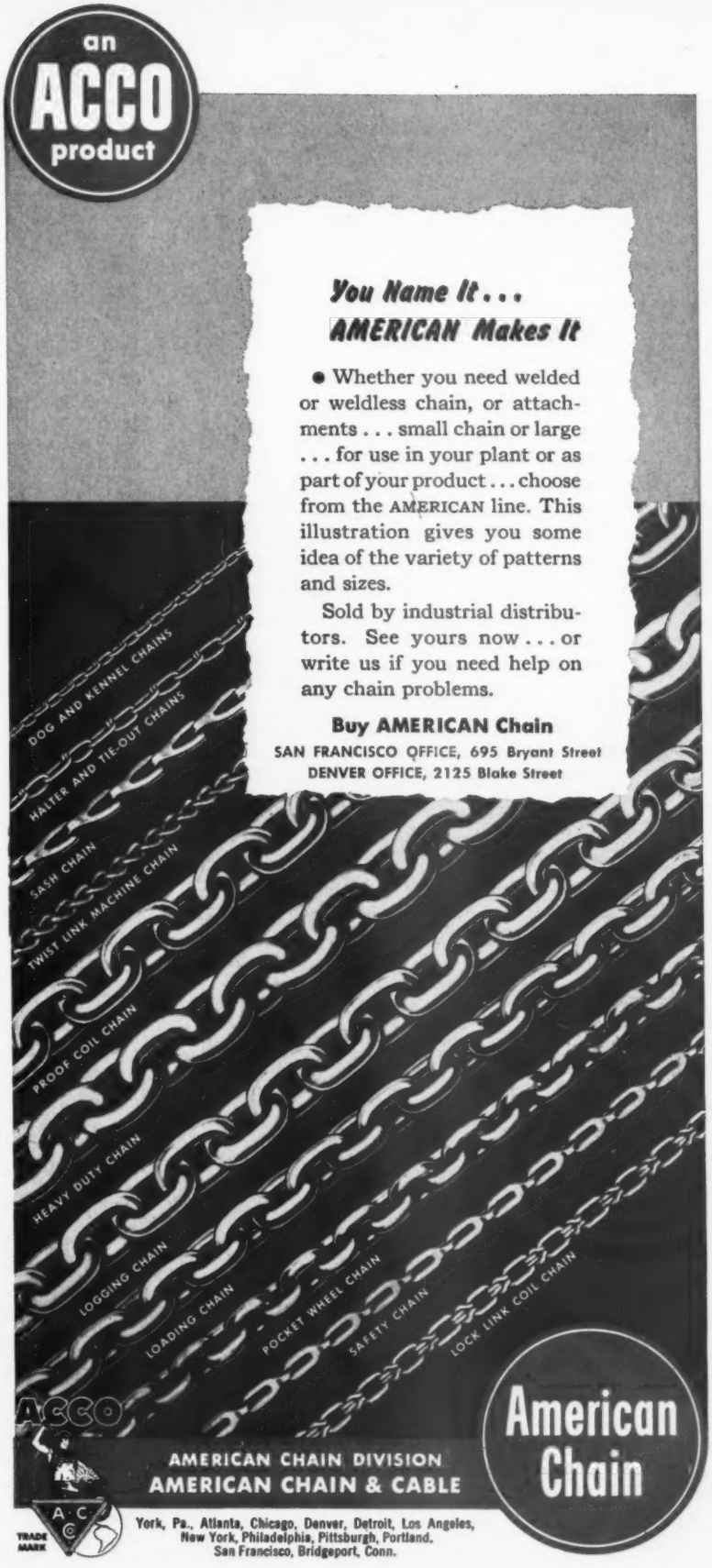
Plastic squares completely covering top of the board are equipped with metal strips on each side and held in place by magnets imbedded in the square, wooden device. Savings in time are effected in this new process over previous methods. Before it was developed, new drawings had to be made each time equipment was shifted. Machinery plotted on this layout is used at Northrop-Anaheim to produce T-41 optical range finders for U. S. Army Ordnance Corps' tanks.

BENT PIPES to specification

A SMALL industrial enterprise in Mapleton, Utah, originated by its two owners, Hugh and Carlos Hjorth back in 1945, bends huge pipe into all angles and shapes and degrees.

The Hjorth process of bending 14-inch pipe without letting it collapse is accomplished by standing the pipe on end and filling it with sand which is vibrated in solidly by an air hammer. Pipe is then placed in a brick oven approximately three ft. wide, 20 ft. high—heated red-hot.

Following this treatment, pipe is removed from furnace and clamped down on the bending floor. Then, with a cable winch, piping is bent into required shapes. Result is a pipe that conforms in a precision-like manner to any previous specifications that you may have drawn up.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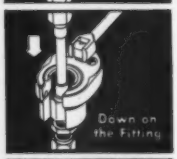
...the versatility of the *socket.*



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FREE CAR WASHES as a company project

EMPLOYEE relations, always an important facet of manu facturing activity, is now extending into the company parking lot in a new way. Weyerhaeuser Timber Co., Longview, Washington, has installed a pair of free car-washers for the 2,447 employees of the forest products plant.

Industrial dust and soot settling on employees' cars stimulated a plant electrician to suggest this means of removing it, and the firm's millwright department set to work and built these two quickie car-washers. Operating around the clock, the washers are automatically actuated when an auto is driven over the service station-like alarm hose. Water is pushed out of nine nozzles at 125 lb. pressure for a sequence of 45 sec. A time relay shuts off the water automatically. Drivers remain in their cars during the process.

Weyerhaeuser's Longview Lumber division manager, Harry E. Morgan, reports: "This new service has proved so popular that many families come to the plant on their days off to soap their cars for a complete job.

"You have to be careful about one thing: one of our men forgot to close his car's side vents before he drove through, and he got a free shoe wash as a future reminder."

INDUSTRIAL SEMINAR on the UCLA campus

AN INDUSTRIAL engineering and management seminar will be offered on the UCLA campus, beginning January 20, consisting of ten weekly sessions, with Ralph M. Barnes, professor of engineering and production management, and Joseph D. Carrabino, lecturer in production management, as seminar leaders.

Professor Barnes will present motion and time study and work methods and measurement. Among other topics are a case study of industrial engineering by George H. Gustat, of Eastman Kodak; cost control and supervisor incentives by R. W. Irwin of Proctor & Gamble, Long Beach; work sampling statistical techniques by Mr. Carrabino and Robert H. Edgecumbe of Virtue Bros. Mfg. Co.; operations research and linear planning, by Melvin Salveson of UCLA.

ELECTRICITY AND ELECTRONICS
scholarships established

HIGH SCHOOL GRADUATES in San Francisco and Los Angeles are being smiled upon by West Coast Electronic Manufacturers Association, who has just established a fund for scholarships in electricity and electronics in California colleges.

Sponsors of this fund include Hoffman Radio Corp., Gertsch Products, Inc., and Ungar Electrical Tools, Inc., all of Los Angeles, and A. H. Kolbe, New York, publisher of Radio-Television Journal. E. P. Gertsch, president of his own firm, is chairman of the scholarship fund committee.

Stated purpose of the fund is to stimulate interest on the part of high school graduates who intend to select electrical or electronic engineering for their profession.

Scholarships will be given in both San Francisco and Los Angeles. Schools to receive these awards this year and next include Stanford, Caltech, UCLA and USC.

AIRPORT LIGHTING
controlled from plane

AN ELECTRONICALLY controlled lighting system, newly installed at the Kingman, Arizona, municipal airport by Bonanza Air Lines, permits the pilot of a Bonanza plane to turn on field's landing lights from his aircraft at any point within a radius of 1 to 100 miles from the airport.

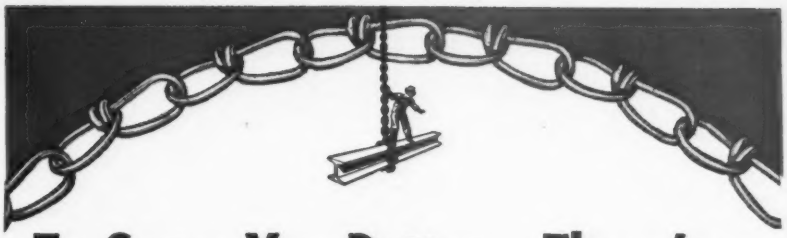
Pilot simply presses the microphone button three time to turn lights on and five times to turn them off. No ground personnel need be present at the time.

This radio controlled lighting system was set to cover Bonanza's nonstop night coach operations from Las Vegas, Nev. to Phoenix, Ariz.

KEEP SALESMEN POSTED
on production schedules

AVERY LABEL Corporation of Monrovia, California, makes it possible for its salesmen to assure their customers of delivery on schedule by supplying them with weekly production schedules. Thus the salesman can forecast exact delivery date. Schedules are adjusted each week to meet slight fluctuations in production demands.

The Avery Corporation reports that the plan has resulted in a record of less than one per cent errors or delay in shipment. If emergency breakdowns occur, customers are notified in advance of any delay of their scheduled delivery date.



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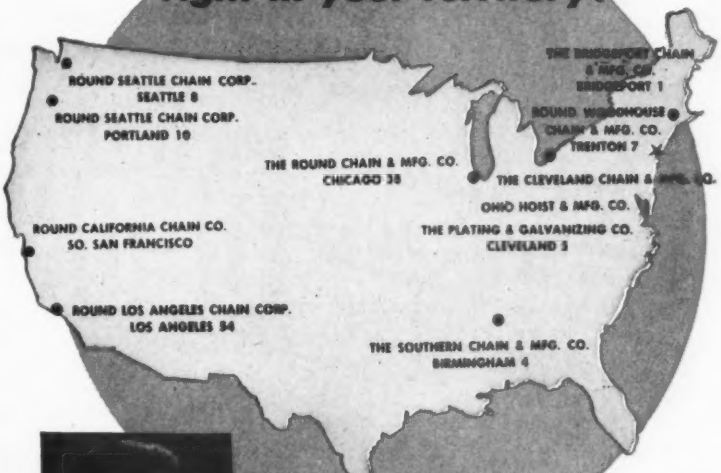

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ROUND WOODHOUSE CHAIN & MFG. CO.— established in 1884 — joined the nationwide Round organization in 1936. Under the management of Willis J. Keenan, who has been a Round Chain man for 15 years, Woodhouse now offers *a complete line* of welded and weldless chain, slings, chain hoists, electric hoists and trolleys to the important Middle Atlantic market. *Sold exclusively through distributors and wholesalers.*

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EFFICIENT STEAM GENERATION
shows promise for coal reserve use

A STRIKING EXAMPLE of the increasing efficiency of steam generation of electric power is offered in the experience of the Utah Light & Power Co. It seems to indicate that if and when the West runs out of economical hydro, and if natural gas and oil should be too expensive, the vast coal reserves of the West can be put to good use.

A thumb-nail history of what has been happening to coal in the field of steam-electric generating plants is provided by the Utah Power & Light Company, which operates in an area with an inexhaustible supply of the fuel.

During the period when coal has been trying to price itself out of the market by more than doubling in price, UP&L has nullified the spiraling fuel cost by increasing plant efficiency by more than two and one-half times.

Briefly summarized, here is the record:

In 1912 the company built two plants which required 2.3 pounds of coal to generate one kilowatt of electricity.

A 1929 vintage plant produces one kilowatt with 1.5 pounds.

Fuel Needs Go Down

The fuel requirement of the Hale No. 1 plant, built in 1936, is 1.25 pounds; of the Hale No. 2 plant, built in 1950, 1 pound; of the Gadsby No. 1 plant, built in 1951, .95 pound.

And now the Gadsby No. 2 plant, which will undergo tests before the end of 1952, will reduce the coal consumption to .88 pound.

This newest plant will have a generating capacity of 75,000 kilowatts for a construction cost of $13,000,000. It is designed to burn residual fuel oil, natural gas or coal and will operate initially, at least, on coal. Its efficiency is due to the high operating pressures and temperatures plus reheat.

The turbine steam pressure is 1,450 pounds per square inch; the turbine temperature 1,000 degrees F. and 1,000 degrees F. reheat; boiler drum

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pressure, 1,700 pounds per square inch; boiler outlet temperature, 1,000 degrees F.; boiler height, 134 feet; reinforced concrete stack height, 250 feet; fuel consumption per day at full load, 130,000 gallons of pitch, 19,600,000 cubic feet of gas or 800 tons of coal.

The Efficiency Story

Following, very roughly, is a generalized history of the course of steam plant efficiencies:

In 1925 maximum pressures were about 400 pounds per square inch and maximum temperatures about 400 degrees F. Between 1925 and 1929 reheat came in with 1,250 pounds pressure and 750 degrees for the first heat and the reheat. In 1930 pressures went to 1,800 pounds.

With the advent of the depression, the price of coal dropped and interest in increasing efficiency dwindled. By 1940 the price of coal began rising and interest in higher pressures, temperatures and reheat was revived. Temperatures were pushed up to 900 to 950 degrees in 1940 and to 1,000 degrees in 1945. In 1947 the coal price increased more than $1 per ton in one jump and the generating industry began boosting temperatures to 1,050—1,100 degrees with reheat.

Interest is now growing in double reheat.

Increasing generating plant efficiency, of course, involves greater investment in plant and equipment. But Utah Power and Light Company engineers figure that they can afford to spend $1,825 more per kilowatt for each $1 per ton rise in the cost of coal.

DEVICE TAKES GUESS-WORK out of aircraft engine testing

A DEVICE for testing exhaust system headers and manifolds to find weak areas and brittle spots has been developed at Pan American World Airway's Pacific-Alaska division base, San Francisco. Idea man who figured it all out is Pan American engine inspector, Max Brodofsky.

His invention, an electro magnet called Magne-Probe, is essentially a sensitive, stable bridge which measures inductance of a coil whose core is the structure being tested. Inductance of the coil is proportional to permeability of the core material, and therefore is a measure of heat corrosion of the structure tested.

Until now, engine inspection was done laboriously by tapping exhaust system piping with a ball peen hammer and finding the weak spots by ear. Brodofsky's new instrument speeds up work immeasurably and increases safety by accurate diagnosis.

• Good light quickly pays for itself in increased worker output. And Appleton Lighting Equipment is precision-built to provide your personnel with the good light necessary for maximum efficiency, high morale.

Appleton Fixtures are easy to install, easy to service. They're made to make the most of the lamp's power. Appleton reflectors distribute light evenly, without glare or troublesome fuzziness.

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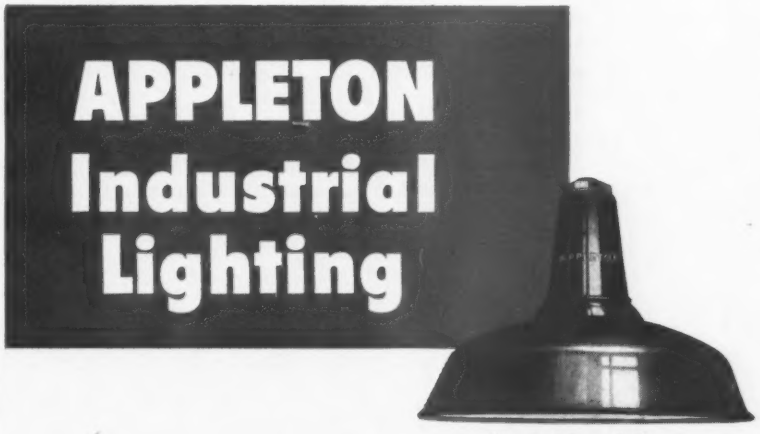

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LOG EMERGES from debarker perfectly clean. Particles of bark and fibre, including rotten wood, clinging to it are washed away.

HYDRAULIC DEBARKER STRIPS stringy coat from redwood logs

WHEN THE MASONITE Corp. came West a few years back, its plan to use redwood pulp for hardboard manufacture in Ukiah, Calif., was confronted with a new set of problems.

For one thing, the redwood tree grows stringy bark which comes off the log in long strips. This regrettable characteristic makes conventional conveyor handling in debarking operations almost impossible, for the bark winds around pulleys, shafts, and generally hampers the entire mechanical process. As a consequence, hand barking of redwood logs was used for this operation.

Special Equipment

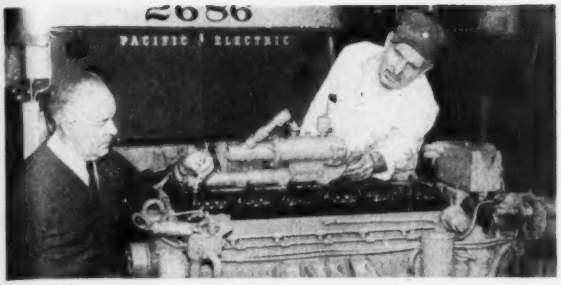
Obviously, some specially made equipment was needed to supplant such a tedious, expensive way of peeling logs. Masonite's answer to the problem of economical bark removal lies in a Simons barker recently installed in the firm's Ukiah plant. This hydraulic debarker is the first of its type and size to be built and used in the redwood belt—fifth of its kind, and the largest used anywhere.

In this machine, the log passes between two barker heads, one mounted over and one under the log. Each head is made up of a stationary housing and a rotating hollow shaft, through which water flows under a pressure of 1,400 psi. into two lawn-sprinkler-type arms having specially designed nozzles. Each of the two nozzles on a revolving shaft shoots 325 gals. of water per minute on the log. Both jets are slightly inclined toward each other for maximum efficiency.

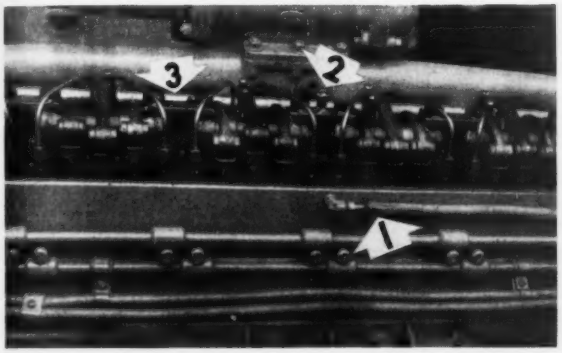
And How It Operates

Amount of water plus pressure makes enough energy to remove and cut up all the bark without injuring the log. In addition, rotten portions of wood are also removed and perfectly clean logs come out of the barker ready for pulping.

Logs up to 60 in. in diameter and 45 ft. long can be handled in the machine —at a rate of speed sufficient to keep the wood-room supplied with barked wood. Equipped with a central control board and fully automatic, it is served by two pumps, one on each rotating head—each with a capacity of 650 gals. per minute at 1,400 psi. pressure. A 700-hp., 3,600-rpm. motor drives each pump.



MACHINIST at right points to oil pressure line extension from which oil is metered across top of the cylinder head through five jumper plates. Foreman at left indicates one of original oil outlets which has been plugged.



PLUGGED OIL GALLERY is bypassed by oil pressure line extension (1) carried to a central point (2) above the head. Oil is metered from this point across top of head through jumper plates (3) bolted to rocker arm supports.

CRACKED CYLINDER REPAIRS by an inexpensive method

AN ORIGINAL, tested method of repairing type-671 GMC diesel cylinder heads, at a maximum saving of $143 and substantial reduction of out-of-service time, is being used on motor coaches of Pacific Electric Railway Co.

Cracking of the metal between water jacket and oil gallery is a fairly common failure on this type of cylinder head. Prior to use of the new method of repair, the firm faced a choice between scrapping the head or shipping it to one of the distant shops equipped to make the standard repair. The latter procedure not only is costly but is somewhat uncertain.

Dan Teleky, general foreman of PE's Ocean Park, Calif., garage, and Dan Lowe, auto machinist, devised the following method of repairing the head:

(1) Plugging the cracked oil gallery; (2) tapping into the oil pressure line at the base of the engine and extending it by a copper tube to a central point above the head, from which point the oil is distributed through jumper plates and rocker arm supports to places requiring lubrication.

Effect of this procedure is to bypass the oil gallery system feeding up through rocker arm supports. Instead, the oil pressure line extension distributes oil across the top of the head in both directions through the five jumper plates bolted to the rocker arm supports.

Pacific Electric has reworked five heads in this manner. One has been operated 37,000 miles and the others less distances with no failures, according to E. A. Stevens, general superintendent of motive power.

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HELPFUL LITERATURE

for the plant operator who wants to keep informed

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1

More profits through progressive mechanization

Progressive mechanization pays such tremendous returns on the added investment that you can't afford to be content with "here and there" methods, according to a booklet on the subject published by *General Electric*. The company's own experience in the field of mechanization—from hand operation through continuous process—is told in an interesting, highly informative manner. (GEA 5789)

2

Industrial water conditioners

A unit package of five booklets covering practically every water problem in industry is offered by *Elgin Softener Corp.* Booklet 551 is a general guide to correct water treatment and used in conjunction with a booklet describing various water testing equipment sets (includes price list) should make you an authority on your own water supply; Booklet 512 describes and gives engineering and technical data on the ultra deionizer which produces mineral-free water; and booklets 609 and 610 comprehensively deal with the field of water softeners and other water conditioning equipment.

3

Mobile paint heater described

Purpose of this *Arco Co.'s* booklet is to show the ease with which its hot spray heater can be inserted into existing spray systems. The heater, which can be carried in one hand or hung from the painters belt, makes for extreme mobility and has the advantage of heating only the paint actually in use. The booklet gives a schematic drawing of the unit's operating principle and instructions for installation.

4

Catalog on heater units

A completely new 48-page catalog, 3570, from *American Air Filter Company, Inc.*, describes both vertical and horizontal shaft heater units manufactured by the *Herman Nelson Division*. In addition to dimensions and general information, expanded steam and hot water capacity data are included for both units. Other sections of catalog show typical wiring diagrams for the motors, and piping and installation suggestions.

5

New uses for adhesives

Up-to-date uses for "3M" adhesives, coatings and sealers in industry are shown in a booklet offered by *Minnesota Mining and Manufacturing Co.* In addition to describing and illustrating 25 industry-wide uses for the material, the booklet lists complete technical information on each.

6

Conveyor association has 64-page manual

"Conveyor Terms and Definitions," a manual on standard nomenclature for conveyor types and parts, has been published by *Conveyor Equipment Manufacturers Association*. The manual contains about 1,500 listings and drawings of more than 80 types of conveyors and parts. The association presents this work in the interest of both the user and manufacturer of conveyor units.

7

Do a better purchasing job

Are you bogged down with needless detail? Emphasizing the importance of the purchasing department, a booklet, X-1202, by *Remington Rand, Inc.*, on purchasing procedures outlines several time and money saving answers. Feature of this book is a check list giving a capsule survey of important information needed for efficient operation. Effective methods for processing requisitions, procuring bids, placing orders, etc., are outlined.

8

Aluminum mill products folder

Reynolds Metals Co. has its new 1953 mill products folder available. It outlines the increasing advantages of wrought aluminum alloys and gives recommended uses for, and engineering specifications on various product forms, finishes, alloys, tempers and casting alloys. (4575)

9

Silver brazing guide

The most complete guide available for all aspects of silver brazing applications and procedures is now being offered by *American Platinum Works*. The 48-page manual provides answers to general questions on low temperature silver brazing, brazing alloys, joint design and other processes through the use of more than 50 drawings and charts. Also included is a specially designed graph which enables you to quickly calculate the thermal expansion of metals at various brazing temperatures.

10

Chamber of Commerce report

Of interest to city and state chambers of commerce and industrial committees is a report from the Industrial Plant Location Committee of the *California State Chamber of Commerce*. Entitled "How to Handle Industrial Inquiries," the report draws extensively on the committee's discussions over the past eight years on the proper methods of dealing with questions asked by industries seeking new locations.

11

Link-Belt offers stock sprocket wheel list

A catalog of over 200 sizes of cast tooth sprocket wheels available from stock has been published by *Link-Belt Co.* The booklet (2467) shows how to order a sprocket wheel accurately fitted to your own chain, and get prompt delivery from stock.

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12

Ingersoll-Rand has centrifugal pump bulletin

Ingersoll-Rand Co. has released a bulletin 7223 covering general purpose centrifugal pumps of the cradle-mount type. Five basic cradle groups and 17 corresponding pump types, their capacities, horsepower ratings and performance under 60-cycle use are described.

13

Baker-Raulang offers product catalog

Catalog 54 released by *Baker-Rauland Co.* describes and illustrates this manufacturer's line of industrial trucks and cranes. Fork truck models from 1,000- to 10,000-lb capacities; high and low lift platform trucks, and crane trucks in 6,000- to 10,000-lb capacities are among the models illustrated.

14

Latest advances in mechanized mining

New 24-page illustrated "Mining Issue" of house magazine "Production Road," issued by *Twin Disc Clutch Co.*, reports on advances in underground and pit mining, quarrying and petroleum production through mechanization. How production of "more from less" is achieved through better machines for mining and transporting ores, fuels, aggregates and chemicals, is described in pictorial articles. Obtain your copy by circling key number on postcard.

15

Conveying equipment catalog

Rapids-Standard Co., Inc.'s revised 28-page catalog is now available. It shows, with photos, drawings, and specifications, an enlarged line of power and gravity conveyors, hand trucks, and industrial casters. Several new equipment models, recently announced by the company, are shown for the first time in this catalog.

16

Can you use ceramic coating?

A study to clear the air of claims and counter-claims for ceramic coating, has been issued by *Ryan-Cameo*, largest producer of ceramics for aircraft use. A relatively new development, ceramic coating has proved its value where high temperature, vibration or corrosion are problems.

17

Catalog on Dodge line

Full enginering information and selection data on the complete line of Dodge torque-arm speed reducers and the new overload release is presented

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in a booklet by *Dodge Manufacturing Corp.* All data and tables have been revised to cover the new size 7 torque-arm speed reducer which increases the capacity range to 43 hp.

18

Fasten it better

If you ever wonder whether the screws, nails or rivets you use on your products are the best type available, you will be interested in a catalog on cold heading published by *John Hassall, Inc.* After explaining the process, this catalog shows the fastener recommended for various purposes and illustrates shapes and sizes of special heads made by the company.

19

Advantages of magnesium dock boards

How *Magnesium Company of America's* light weight, heavy duty magnesium dock boards speed and make safe your loading and unloading operations are described and illustrated in a folder offered by that company. Folder contains photographs showing the bridgeplates in use on the shipping dock.

20

Allis-Chalmers offers centrifugal pump guide

Allis-Chalmers has a handy guide on their complete line of centrifugal pumps. The illustrated booklet discusses both the single and double suction pumps with a head capacity table for the latter unit. Information and illustrations on multi-stage pumps and special purpose pumps such as those used for handling solids, are included. (52C6059J)

21

Where to buy it

Here's an opportunity to get acquainted with a Coast supply house of material handling equipment. *E. C. Buehrer Associates,* San Francisco distributors, offer a product folder of their complete stock. Illustrated are various manual and electric fork trucks and accessories, conveyor units and industrial containers.

22

Adjustable V-belt process explained

No special or standard length V-belt is ever necessary, according to a folder being offered by *Brammer Corp.,* who state that four reels of their link belting replaces 315 different sizes of endless V-belts. The folder illustrates how to assemble the belting to fit any drive wheel and by means of charts enables you to select the size needed according to horsepower and motor speed used.

Your Water Treatment Problem

and how to handle it

A booklet covering the essentials of water analysis, filtration, softening, scale removal, cost reduction by recirculation, cooling tower efficiency.

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a tabulation of water analyses for hundreds of cities in the eleven Western States.

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23

Chlorine units described

Contractors engaged in water and sewage system projects will find interest in two booklets prepared by *Everson Manufacturing Corporation* on their manual and fully automatic chlorine Sterelators. The mechanical and functional description of the company's series of manual and semi-automatic units are described, with control flow charts given for each type. The second booklet deals with the fully automatic units.

24

Keep that wrench off the discard stack

First aid for adjustable wrenches that no longer adjust is the subject of a pamphlet offered by *Utica Drop Forge & Tool Corp.* Common ailments of the tools are dealt with in pictures and "how to fix it" copy. The pamphlet also includes information regarding proper care of new adjustable wrenches to help prolong working efficiency. Also included with this booklet is a similar one on pliers.

25

On a special trailer van for Pacific Coast truckers

A light, extra-strong, full 35-ft. long and 7½- ft. high van that carries full legal loads is introduced by *Trailmobile, Inc.*, in this folder. Complete specs are given on the 8,790-lb. van, which is now being built on the Pacific Coast by men who should know Pacific Coast truckers' problems.

26

Buying guide on pressure regulators

A 44-page booklet from *National Welding Equipment Co.* gives the "why" and "how" of single, two-stage and manifold regulators and gives all the information you need for choosing and specifying. Circle key number on postcard for your free copy.

27

How to handle it gently

Supervisors in charge of loading, unloading, transporting or storing of roll paper or other items of similar nature in quantities will be interested in this rotary roll paper clamp described in *Ira G. Perin Co.'s* bulletin. The merits of the Elwell-Parker clamp and the dimensional specifications are given.

28

Dermatitis preventive described

A new invisible protection against industrial dermatitis is described in a folder by *Vanfaire Products, Inc.* Price list is included.

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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29

Magnesium dock boards described

Magline, Inc., offers bulletin DB203 on their standard magnesium dock boards with instruction on how to order any one of 34 prefabricated standard boards.

30

Basic information given on steel tubing

If your industry uses steel tubing or if you are a purchasing agent of such material, you will find folder 10 of *Pacific Tube Company* offers quick answers to every day problems. Listed are standard manufacturing tolerances on outside and inside diameter, wall thickness and commercial lengths for various tubing sizes and a table shows average physical properties of various tubing analyses. The products which Pacific Tube Company handle are briefly described.

31

On control of paint overspray

Use of the "RP Paint Arrestor System" to control overspray from painting areas as the sure way of protecting against property and fire damage is explained in a booklet published by *Research Products Corp.* Varied applications are described and illustrated. A table of data is included to show how the system would fit into your operation.

32

Manual and air operated bag holders described

Designed for fast and simple operation, the Richardson Universal Bag Holder for burlap, cotton, paper or lined bags, is described in a bulletin offered by *Richardson Scale Co.* Bulletin gives operating details for four different holders, and covers high-speed filling operations, filling different sizes and types of bags, handling of toxic materials, filling from various sized spouts, and other essential bag holding information.

33

Square tubing information

Drake Steel Supply Co.'s Fact Finder No. 1 is chock full of pertinent facts regarding square tubing. Punched for easy insertion in binder as permanent reference, folder covers such subjects as: suggested uses, how square tubing is made, tolerance on size, tolerance on side, squareness of sides, twist, radii of corners, etc. A handy table shows approximate physical properties of some typical sizes in stock and a second table gives sizes of square tubing available.

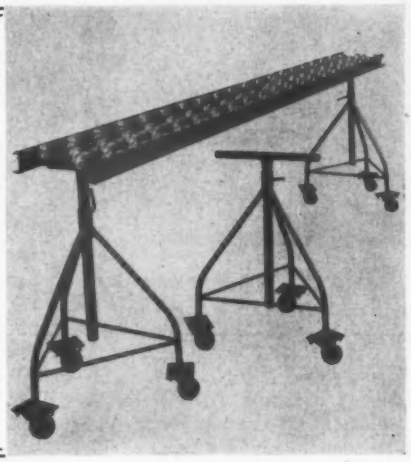
USE RIP-OUT POSTCARD for more information on products introduced this month.

NEW MATERIALS & EQUIPMENT

34

Portable tripod stands for gravity conveyors

These new Speedways Tripod Conveyor supports with casters provide quick and easy movement of conveyor sections. Three inch hard-rubber casters move easily over factory floors. Conveyor does not require bolting to stand, hence can be quickly set up. Available in three models: small, medium and large. Special stands can be supplied for special height adjustments. Speedways Portable Tripod stands can be used with almost all makes of conveyors. *Speedways Conveyors, Inc.*



35

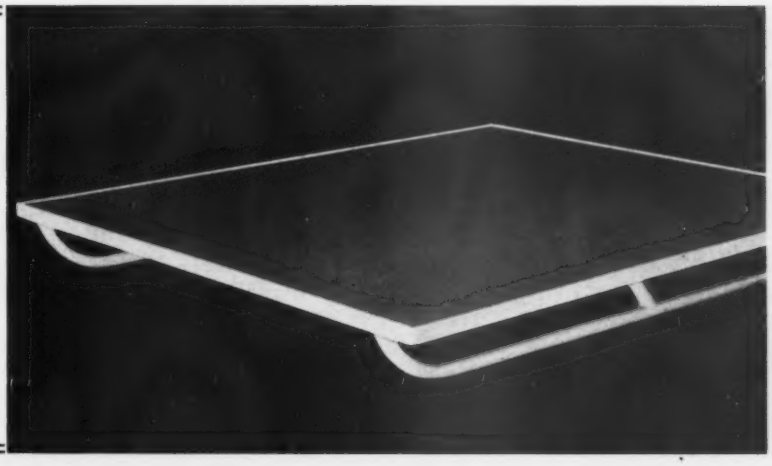
Ingenious gloves mean safety for hands

Extra-long leather fingers and a 5/8 in. steel ball stitched securely into end of each provides a means of protecting all four fingers of a worker's hand in same way that safety shoes protect toes. Boss Ball-Tip Gloves come in style No. 1501 with 5-in. gauntlet cuff and style No. 1502 with 2½ in. safety cuff. From *Boss Manufacturing Company.*

36

Tubular steel pallet

Available from *Econweld Co.*, is lighter than wood pallet of same dimensions and load capacity while priced in same bracket. Runners are weld-braced to angle-iron bound deck. Built to specification at no extra cost.



37

Mobile unit stitches cartons on the spot

Economical wire stitching operations right in the field are now possible with a new mobile carton stitching machine powered by a gasoline engine. Where electricity cannot be supplied conveniently, *Acme Steel Co.'s* "Silverstitcher" may be supplied with 1-hp. Briggs & Stratton 4-cycle gasoline engine. Unit can be mounted on trucks, pushcarts, dollies or any type of power truck equipment and has been found to be especially useful for field packaging of fruits and vegetables.

38

Clean sweep with new vacuum machine

Multi-Clean Products, Inc., has a new industrial plant sweeper, said to cut maintenance time up to 80%. Sweeping is done by eight sturdy 36-in. hardwood, Palmyra filled brushes welded into a single circular unit 17-in. in diameter and 36-in. long. Built-in vacuum is mounted directly on engine shaft. A 1½ - 2 hp. Briggs and Stratton air-cooled engine delivers power to pull operator on riding sulky, as well as to operate sweeper at a speed up to four miles an hour.

39

Conveyor curve quickly pays for itself in time saved

The Wilkie Co. develops a time-saving 90 deg. conveyor curve requiring no adjustments when direction is changed. Wilkie Mobile Flop-Over Conveyor Curve is made for filling and emptying freight cars. According to firm, it provides great flexibility and completely eliminates all setting up thus saving time normally required to reverse and position conveyors for box car loading. Curve is ruggedly built and rolls easily into position on casters. When used in combination with Wilkie Telescopic Conveyor, it can be incorporated into any conveyor system. Both wheel and roller models are available.

40

New line to fill every phosphating requirement

Turco Products, Inc. develops a complete line of Turcoating materials designed to fill every phosphating requirement and to meet applicable Government specifications. Line is comprised of six materials one of which will provide proper coating for any type of organic finishing, according to firm, quickly, economically and efficiently.

41

Gasoline powered low-lift platform truck for speedy long-distance moving

Elwell-Parker's gasoline powered low-lift platform truck is for use where heavy loads must be moved at high speed over long distances and in well ventilated areas. Featuring low cost and rugged constitution, machine is designed as self-loading carrier, permits handling of all types of skids

Valley

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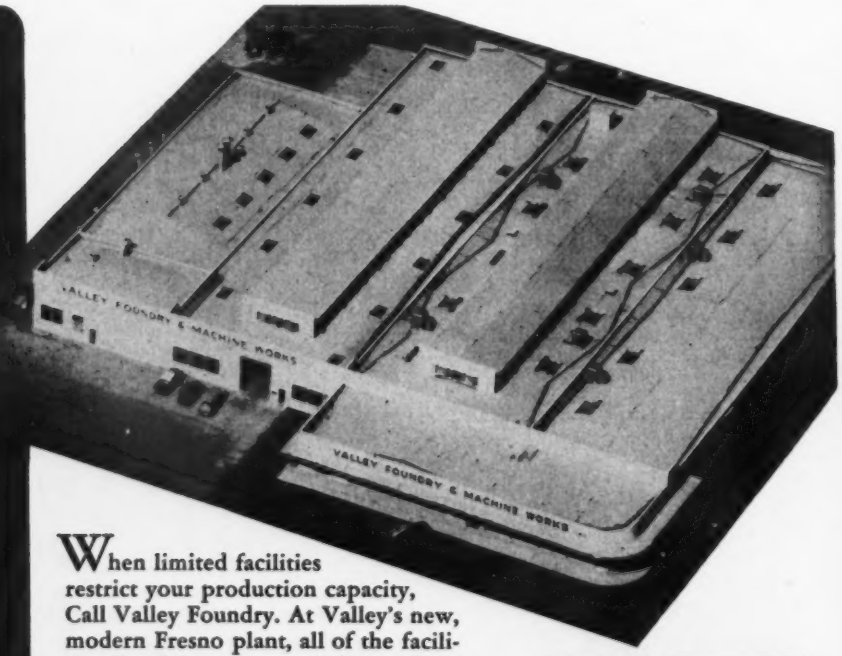

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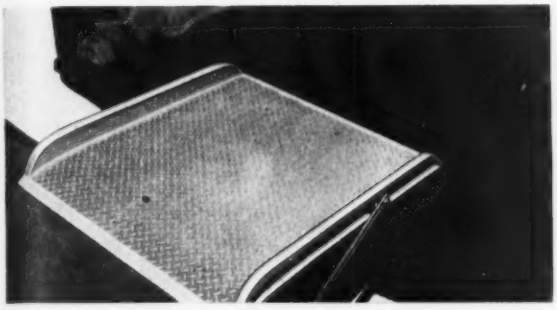
and skid boxes as well as many special racks and other load supporting devices. Models in three and five ton capacities are available—either in standard dimensions or altered to suit special load handling requirements. Available through *Ira G. Perin Co.*

42

Magnesium dock board is strong and light-weight

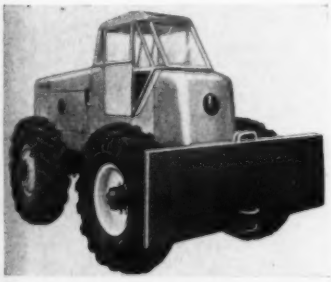


Designed for specific use in truck loading operations, *Magline Inc.'s* new model magnesium dock board is prefabricated in a wide range of sizes to meet requirements for nearly all ordinary loading activities. Unit combines bridge design strength with extreme lightness and easy, one-man handling. It is made in two rated load capacities: 1,000 lbs. and 2,000 lbs. per axle. Board is crowned to compensate for height differences between truck and dock level and can be reversed when truck bed is lower than dock. An automatic drop-lock anchors board in position. Design of board permits truck to back to within 3 in. of dock.

43

Rubber-tired tractor has four-wheel drive

Here is a four wheel drive rubber-tired tractor, Model TM "Payloader," available with a 106 hp. gasoline or a 90 hp. diesel engine. It weighs 25,000 lbs. and develops up to 16,000 lbs. and 14,000 lbs. drawbar pull with gasoline and diesel engine respectively. Features include: full reversing transmission, providing four gear ratios in both forward and reverse; speeds up to 27 mph; a torque converter drive in addition to a friction clutch. Company recommends this tractor for heavy-duty drawbar and pushing work, both on and off pavement. Available from *The Frank G. Hough Co.*



44

Safety offered in adhesive corner protector

Mystik brand "Self-Stik" corner protectors, is a new product used to cover sharp corners of metal sheets. This type of protective covering eliminates costly refinishing and replacements caused by exposed corners scratching or damaging other materials and is proving as a safeguard against personal injuries. Each protector is made of a tough rubberized fiberous material cut in triangular shape and scored for quick folding. A paper backing peels off to expose pressure sensitive adhesive, and, when fixed to a corner, device stays on securely. On removal, it peels

"Wonder how we could give our windows a really bright Christmas look?"

"It certainly paid to look in 'Classified' for a professional window dresser!"

For your store, office, or building needs, always look first in "Classified," the handy *local* shopping guide. The Yellow Pages list just about everyone in town who sells or serves. That's why, when you need any product or service, you'll find it fast in the Yellow Pages.

Why do 9 out of 10 people use the Yellow Pages as their best local shopping guide? One good reason is that "Classified" not only lists everything from automobiles to X-ray equipment...it gives the names, addresses, brand names and other information you may want. With "Classified" you always have the business world at your finger tips.

You'll find it fast in the

YELLOW PAGES

of your Telephone Directory

Pacific Telephone

off quickly leaving no residue. From *Mystick Adhesive Products.*

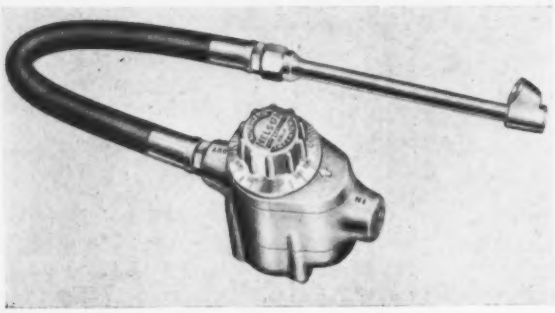
45

Used optical flats can be like new

A rehabilitation service, which restores worn and scratched optical flats to original transparency and accuracy is now offered by *Acme Scientific Co.* Shop-worn flats, it is claimed, can be expertly reconditioned like new, at savings of as much as 40 per cent of the price of a new optical flat.

46

Pressure set saves time with tire inflation



Nelson automatic tire inflators are good news for truck fleets. By simply setting desired pressure on easily-read dial and pushing chuck on valve stem, equalized pressure inflates tires and cuts off at exactly pre-set pressure. Operation of regulator sets up a "clicking" which can be both heard and felt—operator knows when air is flowing and can tell instantly when it stops. Light, compact—easy to handle, they also feature rugged design for long service life and lasting accuracy. Manufactured by *Nelson Specialty Corp.*

47

Stand-up fork truck for tight fits

An electric "stand-up" fork truck, "Stoway," which can operate within its own length, is *Clark Equipment Co.'s* newest addition to its line of materials handling equipment. It is designed for warehousing and freight terminals where close quarters and narrow aisles demand high maneuverability and where driver must continually mount and dismount. Its capacity is 2,000 lbs. at 24 in., 2,500 lbs. at 15 in. and 1,650 lbs. at 30 in. Main features claimed for new truck are: driver comfort; easy "off-and-on" access, convenience of controls and excellent visability.

48

These leather gloves can "take" 800 deg. heat

All-leather heat-resistant gloves with claimed ability to "take" temperatures up to 800 deg. F. are manufactured by *Liberty Dressing Co.* and distributed by *Mine Safety Appliances Co.* Soft flexible leather impregnated with insulating and refractory material is used. Inseam construc-

PEAK PRODUCTION Demands Dependable Dick

BARRY CONVEYOR PULLEYS

Welded steel construction. Light in weight yet extremely strong. They're easy to install. Available in a wide range of sizes for all general conveyor services.

DICK ROPE V-BELT DRIVES

V-Belt and sheaves operate with engineered efficiency. Give maximum service with minimum stretch . . . Resilience maintained. Sheaves carefully balanced and accurately machined to minimize belt wear.

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Industry has recognized through years of experience that Dick power transmission and conveying equipment has a reputation for greater efficiency . . . longer life . . . and rugged ability to absorb repeated peak operating demands. Call or write the R & J Dick Co. office nearest you for help in increasing the efficiency of your production.

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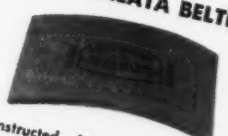

Constructed of hard surface, closely woven duck. Thoroughly impregnated with Balata Gum. Free from stretch and shrinkage — and moisture resistant. High in power transmission efficiency. All "Dick-belts" guaranteed. MF 551

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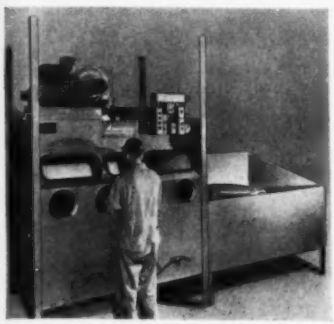
SEATTLE 4, WASH. 307 MARITIME BUILDING MUTUAL 1922

tion guards threads against undue wear, and inner lining is sewn into finger tips to prevent separation when gloves are removed from perspiring hands.

49

Wet blasting unit designed for precision cleaning

Model 64 Liquamatte is added to *American Wheelabrator & Equipment Corp.'s* line of wet blasting machines.



It is intended for all precision cleaning and finishing applications involving large and heavy pieces. Typical applications are in manufacture and maintenance of forging dies, die-casting dies and drawing dies. Machine, 6 ft. long by 6 ft. 10½ in. deep by 8 ft. 11 in. high, will handle single pieces or loads up to 3500 lbs. As a safety feature, machine height allows operator to stand on floor, and a clear view of work is available through large vision windows.

50

New ratchet wrench for impossible angles

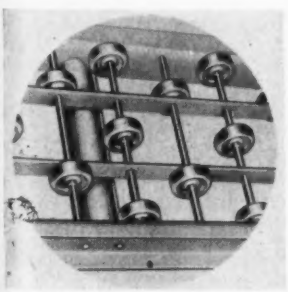
TAC Open End Ratchet Wrench has open end design making it particularly versatile in hard-to-get-at locations.

Other features include: use of unusually strong steel alloys in its make-up; thin wall sockets from ⅜ in. to 4 in. in 1/16 in. increments and in 64 sizes; a full hinge, square drive, removable handle; ratcheting arc to 5 deg.; and adapters which, when quickly snapped in, allow ordinary sockets to be used with TAC wrenches. Manufactured by *Tubing Appliance Co.*

51

Strength and lightness combine in aluminum conveyor

A new Steel Wheel-Aluminum Frame gravity conveyor that combines strength with lightness comes from *The Rapids-Standard Co., Inc.*, as answer to need for a portable conveyor that has sufficient durability to stand up under heavy loads. Conveyor is manufactured in 45 and 90 deg. curves, 5, 8 and 10 ft. lengths, and 12 and 18 in. widths. A five-ft. section 12 in. wide with 8 wheels to the ft. weighs only 23 lbs. yet is said to support a half-ton distributed load.



52

Porcelain enamel coating for steel is highly acid resistant

Seaporcel Metals, Inc., calls its new high acid resistant porcelain enamel coating for steel CRC-14, and reports

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One-half trolley illustrated

Note the high carbon steel drop-forged swaged type bracket, retainer type ball bearings, double labyrinth grease seals, flangeless steel wheels with hardened and ground races.

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that this finish is also outstanding in its ability to withstand thermal shock. Firm maintains characteristics of this finish when applied to low carbon steel, compare favorably with those of stainless steel and that it should provide an excellent substitute in many applications. Company is ready to produce CRC-14 on steel to meet any requirements at a cost only slightly higher than that of porcelain enamel.

53

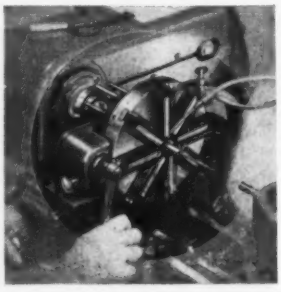
Slide-chart simplifies buying sheaves and chain

David Round & Son brings out a new device called a "Selector" as a buying aid to purchasers of pocketed chain sheaves and guides, grooved idler sheaves and chain. All specification data required in ordering these products is contained in this selector sized at approximately 6½ by 5¼ in. Both sides of chart are used in supplying information. Mark No. 53 on postcard for your free chart.

54

Accessory increases productivity of lathe operators

General Roto Head is an accessory for multiplying small lathe production of duplicate parts. It is designed to fit any engine lathe between 9 and 12 in. swing and can be installed with no lathe alterations. Using principle of Swiss type automatic machines, it has eight different single point tools mounted in slidable, spring-loaded tool holders. Two diameters are possible for each cutting bit, and, by varying set-ups of different bits, up to 16 different diameters can be produced on one job. Available from *General Roto Co.*



55

Work gloves provide positive gripping action

Here is a new grip for the man who works with his hands. Armor Grip work gloves, made with closed, flexible metal zippers permanently bonded to finger and palms in synthetic rubber, provide positive gripping action and long wearing qualities plus maximum pliability. Available from *Surety Rubber Co.*

56

Expansible truck-trailer converts into a room

A military truck-trailer whose telescopic side-walls can be expanded quickly to convert trailer's interior into a room, 14 ft. wide by 20 ft. long, is a new development of *Trailmobile Inc.'s* Cincinnati plant. In transit, this trailer is only eight ft. wide, conforming to laws regulating vehicle widths. On arrival at destination, one man with a hand-crank can extend side-walls until trailer's over-all width is 171 in. When stationary, six jacks—three to a side—are placed under trailer's extended sides to insure stability.

While first units will be used by U. S. Air Force National Guard, Trailmobile engineers point out that this type vehicle can be utilized for many purposes—both military and civilian.

57

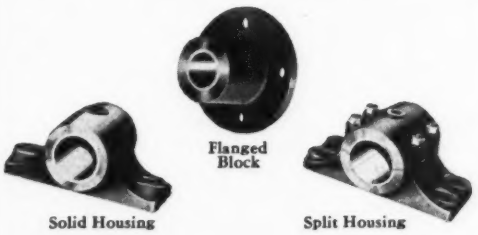
Flexible metal hose stays bent

Johnson Metal Hose, Inc.'s flexible lines for conveying coolants, air, cutting oils and lubricants are, according to manufacturer, outstanding in following features: they are manufactured from high grade oil tempered steel; tubing will stay in position when bent; they are leakproof under constant pressure; they are easy to bend and inexpensive. They can be ordered in standard overall lengths with fittings attached and are also available in mill run coils with fittings loose.

58

New water-emulsion adhesives feature fast initial tack

Fast initial tack, retack and long "open time" are features available in a series of newly designed water-emulsion adhesives from *Paisley Products, Inc.* They were developed for application to seams in manufacture and in final closure of water-proof paper bags, wraps and case liners to meet requirements of new military specifications. These adhesives will find use for domestic and export packaging re-



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For all the facts, contact your nearest Link-Belt office.

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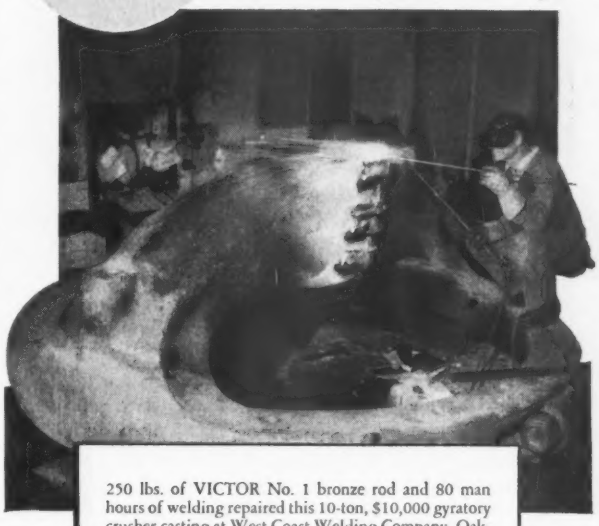
THE MAN ON THE JOB
likes Victor adaptability!



250 lbs. of VICTOR No. 1 bronze rod and 80 man hours of welding repaired this 10-ton, $10,000 gyratory crusher casting at West Coast Welding Company, Oakland, California. Job was done with VICTOR No. 310 welding torch butt with No. 320 extension and No. 10 and No. 12 Multiflame nozzles.

Whatever the job . . . welding, cutting, heating, brazing, descaling . . you'll start it quicker, finish it sooner with versatile VICTOR *equipment.*

Here's why:

- HAND-TIGHT QUICK-CHANGE nozzles and cutting attachments are on or off with a twist of the wrist —no wrench needed!
- STEADY FLAME—set VICTOR torch ball-point control valves to the flame you want and it *stays!*
- EFFICIENT MIXING in VICTOR'S exclusive spiral mixer and gas proportioner means peak performance at every setting, with every type of VICTOR nozzle.

VICTOR

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GET THE FACTS—AND YOU'LL GET VICTOR

302

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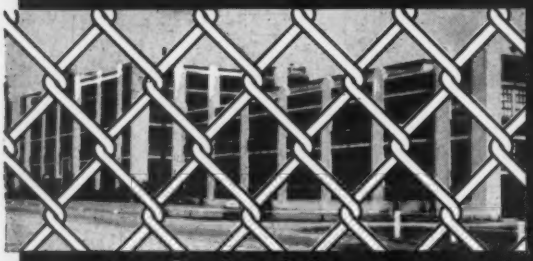
REALOCK
FENCE



gives **locked-in** protection

All fittings on Realock Fence have bolts so placed that nuts cannot be removed from the outside. This means that Realock Fence provides *added protection* for your grounds and property . . . effectively discourages tampering by would-be trespassers.

Strongly constructed, Realock Fence has high resistance to the elements because of a special galvanizing process . . . gives permanent protection and trouble-free service year after year. For additional information write our nearest sales office or consult your classified telephone directory.

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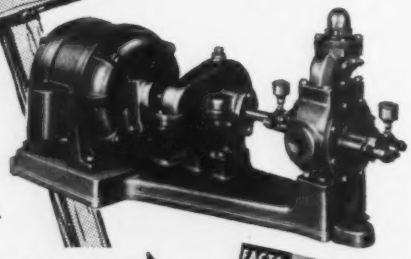

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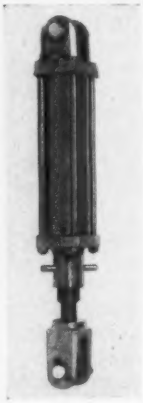
quiring protection against elements. They can be applied by machine or by hand brushing.

59

Hydraulic cylinder has automatic depth control

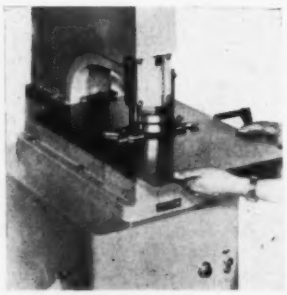


Hydraulic cylinders, built especially for control and operation of Western farm implements, now are being marketed. These cylinders are recommended, by company, for control of plows, bulldozers, scrapers, land-levellers, cultivators, disks, loaders, ditchers, subsoilers and other farm tools requiring accurate, positive depth control or easy lowering, lifting and positioning. Construction is heavy duty, rated for working pressures to 1200 psi. Standard sizes, built to specifications of the American Society of Agricultural Engineers, range from 2 in. bore by 8 in. stroke to 3 in. bore by 10 in. stroke, with 20½ in. between pin centers when closed. Available through *The Rucker Co.*

60

New power punch presses feature deep throat construction

Di-Acro Power Punch Presses Nos. 1 and 2 are new additions to the Di-Acro line of precision metalworking machines. A feature to be considered is their deep throat construction. Manufacturer claims advantages of these new punch presses to be: high rate of production; minimum operator fatigue on long production runs; simplicity of operation; safety; quick setup; compactness; portability; and a material chute which is built into cabinet for delivery of slugs and blanked parts. Flywheel on these power units is driven by a half-horsepower electric motor. Choice of a single-phase 110/220-volt, or a three-phase 220/440-volt AC motor is offered. Produced by *O'Neil-Irwin Manufacturing Co.*



Use rip-out postcard for more information

61

Speedy warm-up with this soldering iron

Snap-on Tools Corp., has a light-weight, two-speed soldering iron that goes to work fast. It weighs 9 oz., and is said to heat to soldering temperature in just 40 seconds. Depressing a thumb button on handle delivers 100 watts at tip for fast heating or for extra heat on heavy soldering jobs. Tip is specially plated with "Vanderloy," protecting the copper from deterioration. While a standard tapered chisel edge tip is furnished with R-115A, six styles and shapes of interchanegable tips are available.

62

Simplified means of long distance communication

From *Farmers Engineering and Manufacturing Co.* comes Femco Audiophone, an improved and simplified method of electronically amplified voice communication for industry. These systems are wired to order and consist of press-to-talk release-to-listen microphones and speakers at as many stations as desired. Unless engineered for private two-way conversations, all stations hear simultaneously though they may be great distances apart. By use of multiple amplifiers and boosters, extensive networks can be installed and coordinated.

63

High-lift pallet truck is a work saver

A 4,000 lb. capacity high lift pallet truck, newly added to Yale Worksaver line of motorized hand trucks, is designed to transport and stack at heights up to 120 in. and has side caster wheels for stability and constant floor contact. Pallet forks are used instead of conventional forks for minimum overall truck length and lowered fork height. Truck is available from *Yale & Towne Manufacturing Company.*

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Have You All The Facts ?

EVERY USER of tubing will find these new Drake "Fact Finders" invaluable in his daily work. They're compact, chock-full of answers regarding tubing—*and punched for easy insertion in binders for permanent reference, too.*

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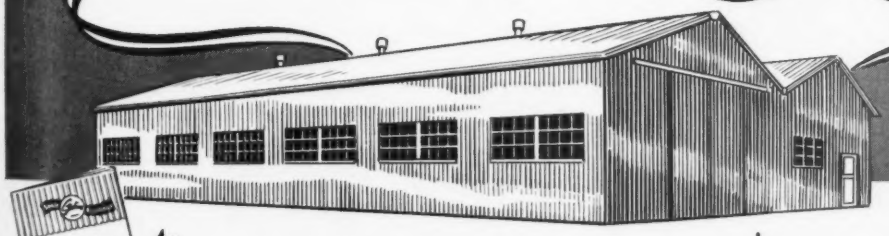

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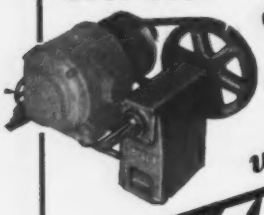

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64

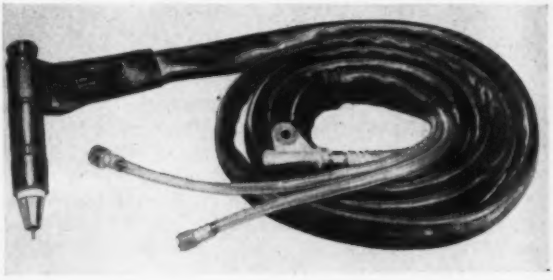
A rugged rectifier

MagniVolt is an AC to DC regulated rectifier combining ruggedness and close regulation of low voltage in a low cost unit. Because its amplifier contains no moving parts or vacuum tubes, virtually no maintenance attention or replacement of parts is required, according to firm. MagniVolt is also claimed insentitive to frequency and temperature changes. It has various expected uses where space and weight are at a premium. Unit is designed for mounting in standard relay racks, with standard cabinets specified as an extra. Equipment includes AC input switch, fuse, pilot light, input and output posts. This comes from *Inet, Incorporated.*

65

Gas leakage eliminated in new Heliarc torch

Linde Air Products Co., division of Union Carbide and Carbon Corp., develops a new Heliarc torch (HW-13) for heavy-duty machine welding and engineered for continuous operation at its rated capacity of 500 amperes. It is light

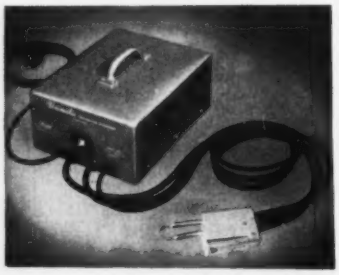


in weight and can be mounted on any machine carriage providing proper speed control for repetitive straight-line, shape, girth seam, or portable welding operations. Gas leakage is prevented by specially designed gaskets used throughout the torch. Design also minimizes stub loss of expensive tungsten electrodes. Efficient cooling of torch body, welding head and gas cup is brought about by water passages inside body.

66

"Tweezer-Type" spotwelder for uniform, burn-free work

New model 1012 Unimatic Tweezer-Type Spotwelder features Unimatic power principle combined with a high performance "tweezer-type" electrode switch assembly. It is designed to meet requirements for a spotwelder capable of producing instrument welds with production line efficiency. According to company, this model incorporates a unique electrical circuit that insures welds consistently uniform, burn-free and dependably secure. Compact, hand-fitting electrode-switch assembly provides rapid and accurate automatic control of pressure, and versatility extends over



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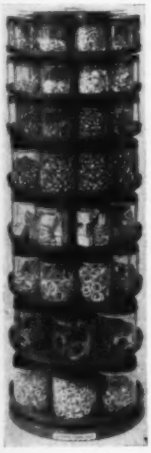
a wide range of materials and thicknesses. Available from *Unitek Corp.*

67

Fine emery paper for ultra fine finish

No. 4/0 emery polishing paper, for producing a fine polish on metal, plastic or wood surfaces, is being manufactured by *Behr-Manning Corp.* It is claimed to be the world's finest grit sandpaper with more than 285,600,000 particles of emery grit per sq. in. This paper is finest of 9 grit sizes of emery and is used to remove scratches on metal and other materials which may be so fine that they cannot be seen by the naked eye.



68

Small spare parts storage is simplified

Vu-O-Matic is a compact, rotating unit designed to simplify storage and handling of small spare parts such as nuts, bolts, rings, gears, bearings, etc. It consists of a series of circular trays accommodating glass jars of various sizes. Complete assembly revolves as a single unit on ball bearings. A tray rim insures that jars will not fall, although they may be removed easily. Manufacturer points out following advantages: visibility; accessibility; protection; economy of space; economy of time in locating and handling parts; inventory control by weight. Available from *Union Metal Manufacturing Co.*

69

Unit charges paint electrically within spray apparatus

Scientific Electric develops Ionic-High Potential paint spraying equipment featuring the Ionic-Gun designed on principle of charging paint electrically within spray apparatus. According to company, paint is highly ionized so that it differentiates between painted and unpainted surfaces, producing an even finish and penetrating into all cavities and crevices. As a consequence, less paint is used in operation and product quality is increased. A wide variety of adapters make it suitable for almost any industrial or commercial application. Skilled labor is not required for operation.

70

Versatile flooring material saves time, cuts down production delays

Trowel-In is a new floor patcher-upper that can be kept on hand, ready for immediate use in any one of several common floor deterioration problems. According to developer of this material, *Flexrock Co.*, it both repairs and resurfaces floors of practically any composition—concrete, stone or brick—and is ready for traffic in 18 hours. As a resurfacing material, Trowel-In needs a thickness of $\frac{3}{8}$ in. and does not appreciably raise floor level. For patching, material produces true feather edge repairs without chopping out old floor. Material shows no shrinkage cracks.

71

Concentrated compound for mixing cutting solutions

Wax-Cut, a new type compound that improves metal-cutting action and reduces tool wear, now comes in concentrated form so that users may prepare their own cutting

Special cold headed products

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FIG. 1432 Heavy duty bar handle platform truck

FIG. 1501-X "Auto-Load" Barrel Truck

FIG. 1411 Balance-type platform stake truck

FIG. 1432 DFL Light weight 2-wheel utility truck

FIG. 18 Western Pattern with Steam Bent Handles

FIG. 215 Golden Gate Pattern

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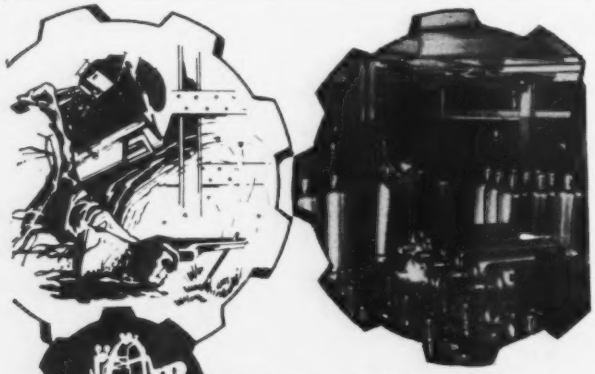

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solutions. *S. C. Johnson & Son, Inc.*, reports that this product, a blend of special waxes, can be mixed 10 to 1 with any type of oil including reclaimed motor oil, paraffin and sulphurized oils. When diluted it serves as a wax-fortified cutting fluid that can be used in automatic screw machines, gear hobbers and cutters, milling machines and oil-type grinders.

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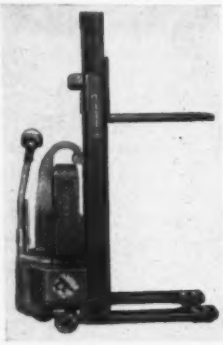
72

Four new trucks for six ft. aisles

Lewis-Shepard Products, Inc. offers four answers to problems of storage space with its new electric materials handling trucks. Each model will operate in 6 ft. aisles with 48 in. long loads, increasing storage capacity up to 50 per cent, manufacturer says. L-S Model "M", a 3,000 or 4,000 lb. capacity riding type out-rigger fork truck will stack 10½ ft. high and travel up to 4 mph. It often teams with Model "M" low lift truck which transports both load and operator. JackStacker and JackLift electric walkies, with capacities to 6,000 lbs. will do the job when long hauls are not involved.



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73

Rivet machine operated by manual control hydraulic valve

The Manco Mfg. Co. introduces Model R-20-185 Riveteer Unit operated by a patented manual control hydraulic valve to produce riveting action. When full pressure (adjustable to 30 tons) is reached, valve automatically provides ram retraction. Release of valve will retract ram at any point in riveting cycle.

74

Copper base alloy suitable for heat treatment hardening

"Telnic" bronze, a copper-base alloy utilizing controlled amounts of tellurium, nickel and phosphorus, is a product of *Chase Brass & Copper Co.*, subsidiary of Kennecott Copper Corp. According to company, its unusual properties include combination of excellent machinability, hot and cold workability, good electrical conductivity, strength, age-hardenability, fatigue strength and corrosion resistance. Material is supplied as round rods ⅛ to 1¾ in. diameter or as hexagonal rods measuring 3/16 to 1¼ in. across flats.

75

Rule marked for fast figuring

Stanley Tools brings out a new Green End folding rule, No. 126, marked so that every joint opens on an even number. Square ends fit evenly with work for accurate scribing. Opened from long leg end, extended sticks may be hooked over work. Comes with big plastic coated figures —grease, grit, and dirt wipe off without decline in readability of figures and gradations.

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Copra, thousands of tons of it to be unloaded. Huge pneumatic conveyors were the answer, but the tubing used for sucking the copra out of the holds must be flexible, tough and armored to stand terrific abrasion.

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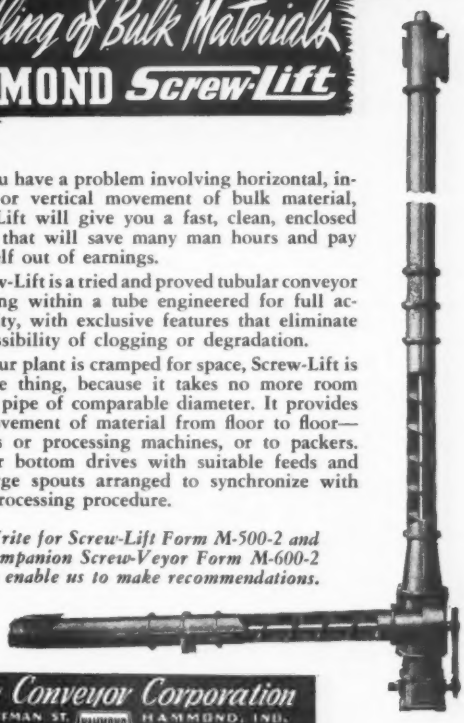

If you have a problem involving horizontal, inclined or vertical movement of bulk material, Screw-Lift will give you a fast, clean, enclosed system that will save many man hours and pay for itself out of earnings.

Screw-Lift is a tried and proved tubular conveyor operating within a tube engineered for full accessiblity, with exclusive features that eliminate the possibility of clogging or degradation.

If your plant is cramped for space, Screw-Lift is just the thing, because it takes no more room than a pipe of comparable diameter. It provides for movement of material from floor to floor—to bins or processing machines, or to packers. Top or bottom drives with suitable feeds and discharge spouts arranged to synchronize with your processing procedure.

Write for Screw-Lift Form M-500-2 and companion Screw-Veyor Form M-600-2 to enable us to make recommendations.

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THE WEST ON ITS WAY

ALASKA

ALASKA-GULF BARGE LINE—Alaska Freight Lines plans to establish a barge line from Pacific Coast and Alaskan ports to Gulf of Mexico and up the Mississippi and Ohio rivers, and has asked permission from Interstate Commerce Commission to commence operations immediately. Company proposes to sail towboats and barges monthly from Alaska, Seattle, Tacoma, Portland, San Francisco and Los Angeles to New Orleans, Memphis, St. Louis, Minneapolis-St. Paul, Chicago, Louisville, Cincinnati and Pittsburgh.

ARIZONA

CAPITOL FOUNDRY EXPANSION — Capitol Foundry Co., Phoenix, undertakes a $2,000,000 expansion program, calling for erection of a new foundry next to the one it now has under construction on a 35-acre site near Baseline Road. Additional construction on this site will bring firm's total investment there to around $3,600,000.

BIGGEST UNDERGROUND COPPER MINE — Reconstruction Finance Corp. grants San Manuel Copper Corp., subsidiary of Magma Copper Co., a $94,000,000 loan to develop nation's largest underground copper mine, located 50 miles northwest of Tucson. This is RFC's greatest loan to date, and it will be combined with private capital for a total investment of $114,000,000 to be used in bringing an estimated 500,000,000 tons of copper, valued at $2,000,000,000 to the surface. A crushing mill and smelter, as well as 1,800 workers' dwellings will be erected for this huge undertaking.

OIL REFINERY NEAR FLORENCE—Proven Oil and Refining Co. will build an $18,000,000 oil refinery on a 1,500-acre site near Florence as a companion project to the 953-mile pipeline connecting Texas and West Coast being built by West Coast Pipeline Co., Inc. Refinery, which will eventually employ about 500 persons, will be capable of processing about 15,000 barrels of crude oil daily, and will turn out both automotive and aviation gasoline, kerosene, diesel fuel, asphalt and other petroleum products.

AIR FORCE FACILITY AT PHOENIX —U. S. Air Force plans erection of a $24,000,000 facility at Phoenix in which two giant aluminum extrusion presses will be installed in a 462,000 sq. ft. building. Structure will be built under direction of Reynolds Metals Co. and operated in conjunction with that firm's Phoenix extruson plant. Plant will eliminate many joining problems now encountered in assembly of the nation's superbomber and other military aircraft projects.

ASBESTOS ENGINEERING FIRM SOLD —Owens-Corning Fibreglas Corp. purchases controlling interest in Asbestos Engineering and Supply Co., Phoenix, and plans to use it to distribute and contract for installation of heat and sound insulations, as a division of Fibreglas Engineering and Supply Co., San Francisco.

CALIFORNIA

BREA CHEMICALS FORMED—Union Oil Co. of California forms Brea Chemicals, Inc., at Brea, as a wholly owned subsidiary to develop, manufacture and market chemicals from petroleum. Marketing activities and personnal of Union Oil's by-products chemical division will be transferred to this new organization.

UTILITY PROJECT—Southern Counties Gas Co. has just completed a new four-story reinforced concrete office building at its 13-acre Triggs St. base in east Los Angeles. The $700,000 building is now occupied by the engineering, accounting, personnel, claims, home service and customer service departments.

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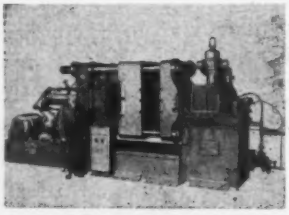
Kux produces the most complete line of air or hydraulically operated machines for lead, tin, zinc, aluminum, brass or magnesium die casting with a size and model for every die casting need. Simple and safe to operate these machines are low in original and upkeep costs and are used in hundreds of plants in round the clock production.

All machines are equipped with extra large oil reservoirs, oversize oil coolers and filters. They have a speed shot up to 1200 feet per minute and a range in locking pressures up to 800 tons.



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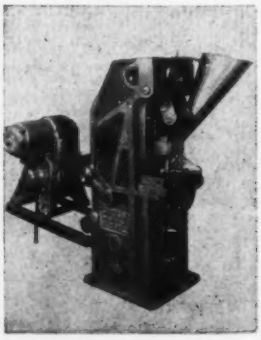

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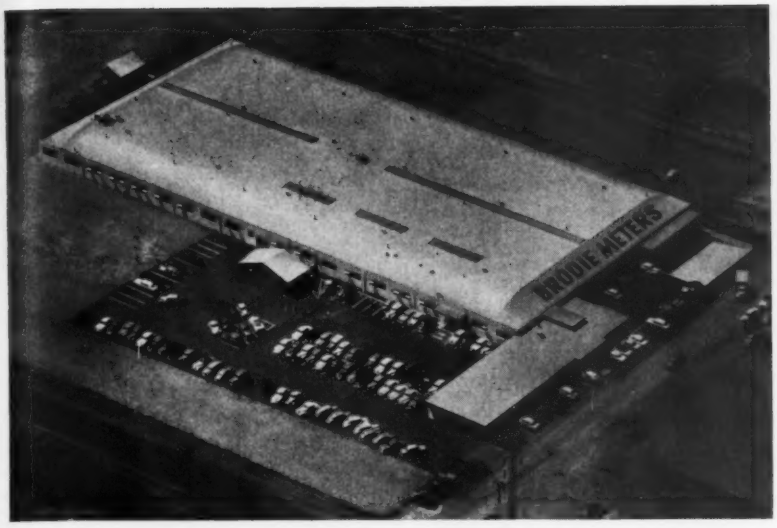


BRODIE'S NEW PLANT—The Ralph N. Brodie Co., Inc., meter manufacturer, completes extensive new plant on a 6½-acre tract in San Leandro. New location provides substantially enlarged engineering, research, production and office facilities, and consists of an 86,000 sq. ft. building area.

Homer Reed, formerly Union Oil's chief engineer, is president of the new firm.

ENTERPRISE MOVES — Enterprise Commercial Co., manufacturer of specialized lubricants and distributor for Ainsworth Manufacturing Corp. (Detroit) Mult-A-Frame steel framing, moves from 515 Market St., San Francisco, to 1268 Folsom St., San Francisco.

SPERRY RETURNS TO STOCKTON—Sperry Flour Co., a division of General Mills, plans construction of a $1,000,000 formula feed mill in Stockton, after a 25-year absence from that area. The 12-acre site on South McKinley Ave., Highway 50, will become key to Sperry feed operations in the West.

NEW OIL REFINERY—in Pinole will be built by Tidewater Terminals, Inc., according to Warren C. Graham, vice president of the newly organized firm. Three contracts have been let so far: one for something over $10,000,000 to Southwest Engineering Co., Los Angeles, for the main plant; one for more than $2,000,000 to Jack E. Hudson, San Leandro, to construct a tank farm, pumping plant, piping, etc.; the other to George A. Renner, Oakland, for over $1,000,000 to build a wharf. Tidewater Terminals, Inc., 3523 Kempton Ave., Oakland 11, is now completely financed, according to Mr. Graham, partly by a San Francisco Bay area individual and partly by Eastern investment bankers.

TUNGSTEN PLANT ACQUIRED — West American Tungsten Corp. acquires Cole & Swift tungsten placer washing plant at Atolia. Plant has been overhauled and rebuilt and placed in operation to treat gold and tungsten placer gravel from properties controlled by that company. Washing plant capacity is expected to approach 50 tons an hour, with 70% recovery of scheelite and gold.

MOTHBALLED GAS PLANT — Construction of a gas plant at U. S. Government's Elk Hills Field is completed. Plant will be completely "mothballed" and not used unless a national emergency makes it necessary, or should private industry be unable to supply Government needs. Capacity of new plant is 50,000,000 cu. ft. of gas daily, representing a potential output of 45,000 gal. of gasoline, 48,000 gal. of propane, 26,000 gal. of butane and 15,000 gal. of isobutane and methane. Plant design provides for doubling capacity, if necessary. Final cost of plant is expected to exceed $6,000,000.

CAMP COOKE CLOSED—U. S. Army's Camp Cooke is placed in an inactive status due to recent oil discoveries on its 84,000 acres of land. Military personnel are rapidly being transferred.

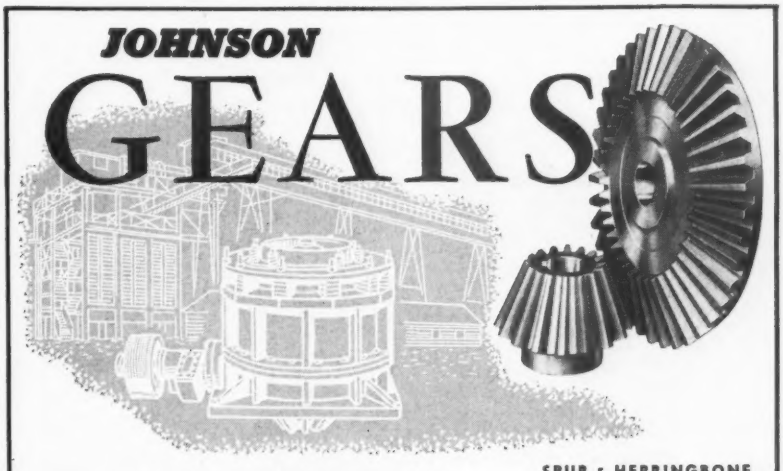
PIPELINE OK—Petroleum Administration for Defense's Munitions Board gives its backing to a proposed crude-oil pipeline from West Texas to California. Proposed 26-in., 1,000-mile line to refineries in Los Angeles area will be built by West Coast Pipeline Co., Dallas, Tex., at an estimated cost of $87,000,000.

SIMPLIFIED OVERHAUL — Western Air Lines, Inc., simplifies its engine overhaul and maintenance by converting all its Convair-Liners' engines to same power plant to be used in its new fleet of Douglas DC-6B's that will go into service early next year. Conversion will increase payload potential of Convair-Liners as much as 1,800 lb. in some instances, and will cost about $175,000.

LINDBERG STEEL TRIPLES—Lindberg Steel Treating Co. expands its Los Angeles facilities with a new plant at 2910 Sunol Drive. New quarters, with 14,000 sq. ft. of floor space, triple capacity of company's old plant. More than 30 furnaces and heat treating units are being installed to permit company to handle a wide range of specialized work.

TUNA FISH — French Sardine Co.'s Star-Kist Tuna cannery at San Pedro is completed at a cost of approximately

JOHNSON
GEARS



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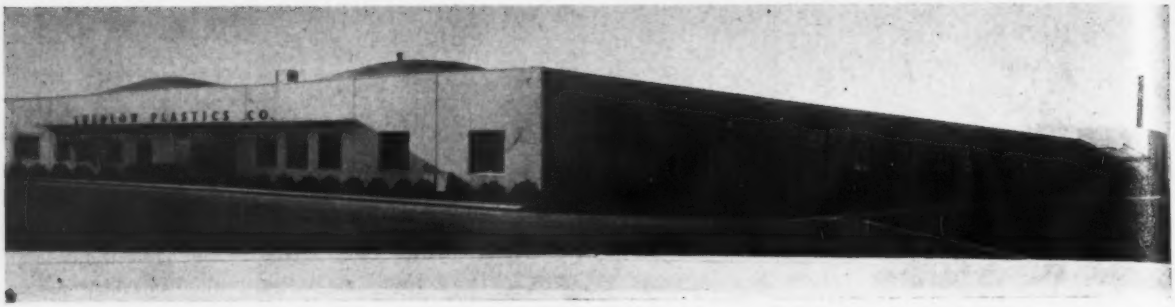

NEW PLANT FOR SWEDLOW—The Swedlow Plastics Co. opens its third manufacturing facility in Los Angeles area. New 37,000 sq. ft. plant, located on a three-acre plot at 6986 Bandini Blvd., also contains firm's general offices.

$2,000,000. One-story plant has 200,000 sq. ft. of floor space, and employs more than 800 persons with a production rate of 86,000 half-pound cans of tuna an hour. Four tuna clippers can unload simultaneously at two finger piers adjacent to the building.

HAMERSLAG TO APPAREL CITY—The Hamerslag Equipment Co. moves to new quarters at 45 Elmira St. in San Francisco's "Apparel City" industrial area. New location provides additional space as well as convenient access for trucks from San Francisco Freeway.

BEARING FIRM MOVES — Southwest Products Co., manufacturer of "Monoball" plain self-aligning bearings, rod end bearings, and mechanical push-pull controls, moves to new factory at 1705 S. Mountain Ave., Duarte. New building is modern, tilt-up type construction and has approximately 20,000 sq. ft. of floor space in addition to adequate parking space and room for future expansion. Approximate cost is $300,000.

BAKER'S NEW WAREHOUSE—Baker Steel & Tube Co., 1400 Calzona St., Los Angeles, commences construction of a new warehouse which will double size of firm's present facilities.

HASLETT WAREHOUSE—Haslett Warehouse Co. plans construction of a $360,000 warehouse on a 117,000 sq. ft. site on Union St., between Third and Fifth Sts. in Oakland. This reinforced concrete structure will provide 54,000 sq. ft. of fully sprinklered warehouse space, and will be principal point of service for firm's fleet of 100 motor vehicles.

ASBESTOS IN VICTORVILLE — Recently released geological survey reveals a deposit of over 1,000,000 tons of asbestos, in addition to titanium and other valuable minerals, in San Bernardino County, just 18 miles from Victorville on property owned by Conda Properties. Owner plans to form a $5,000,000 corporation to exploit these deposits.

LARGEST STEAM PLANT IN THE WEST—New generating unit, adding 117,500 kilowatts to Pacific Gas and Electric Co.'s $80,000,000 Moss Landing steam plant on Monterey Bay, plus another one of equal size, soon to be completed, will make this the largest steam-electric plant West of the Missis-

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sippi, with a capacity of 575,000 kilowatts.

FOR BETTER FREIGHT HANDLING—Santa Fe Railway opens a modern freight handling facility at Fourth and Illinois Streets in San Francisco's China Basin district. New terminal, accommodating both freight cars and trucks, is 695 ft. long and has 36,710 sq. ft. of floor space. Steel, concrete and wood are combined in construction of this new station.

LICENSE AGREEMENT—Al-Fin Division, Fairchild Engine and Airplane Corp., signs license agreement with National Steel and Shipbuilding Corp., San Diego, to use Al-Fin Division's manufacturing technique for joining aluminum and its alloys to steel and cast iron.

MORE LICENSING—Northrop Aircraft, Inc., Hawthorne, awards an exclusive license to Narmco Resins and Coatings Co., Costa Mesa, for manufacture and marketing of Northrop-developed metal-plastic adhesive for bonding Styrofoam to metal and other surfaces.

CHOP SUEY—Oriental Foods, Inc., Los Angeles Chinese packaged food firm, commences construction of new plant at Bell Gardens, which will contain about 400,000 sq. ft. of space and which will replace firm's present plant at 4100 S. Broadway, Los Angeles.

ANOTHER SOLAR ORDER—Solar Aircraft Co. receives an order for an undisclosed number of airborne gas turbine-driven generator sets which will provide auxiliary and emergency power for Douglas C-124 Globemaster cargo and troop transports for Air Force.

QUALITY PHOTOS EXPANDS—Quality Photos, Inc., Hollywood, completes an expansion program which more than doubles present space and equipment. Increased industrial and commercial use of photographs and photo sales kits makes this program necessary.

NEW HOME FOR DILLON—W. C. Dillon & Co., Inc., moves to new plant at 14620 Keswick St., Van Nuys. Plant contains 12,000 sq. ft. floor space and is located on a two-acre site.

FRIED RICE—Sutter Basin Growers Cooperative elevator in Sutter County sustained a loss estimated at about $200,000 when rice valued at $1,500,000 caught fire recently. Reconstruction will start immediately.

SWISS BRANCH FOR WESTERN FIRM—Applied Research Laboratories, Glendale, establishes a branch factory at Lausanne, Switzerland, to supply spectrochemical equipment to European manufacturers. Present plans call for plant of approximately 3,000 sq. ft. to employ 15 technicians, all of whom will be hired locally. Material for highly specialized testing equipment will be purchased in Europe wherever possible.

PICKLES—Hunt Foods, Inc., Fullerton, sells its Mountain View pickle packing facilities to Robert Passerow, Los Angeles, and will center its pickling activities at Hayward in the future.

AEROJET EXPANSION — Aerojet Engineering Corp., subsidiary of General Tire and Rubber Co., plans a $1,000,000 expansion of its facilities on its 8,500-acre site near Folsom. Plant will duplicate the type of rocket engine manufacture now being done for all branches of the armed forces. This firm and the U. S. Government have already invested about $9,500,000 in these facilities, and there are 465 employees on the payroll. Bulk of rocket engine manufacture, as well as the making of rocket propellants is now conducted there. Expansion will add two production lines to the two already in operation.

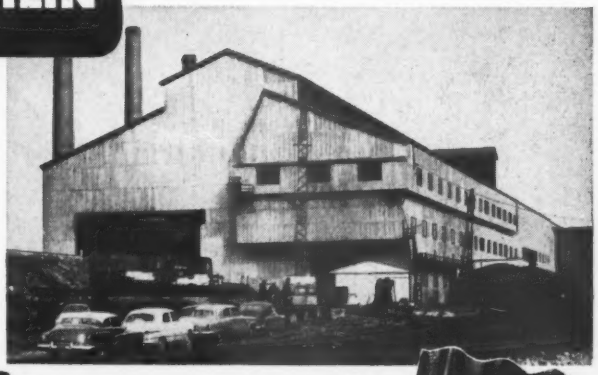
ELECTRONIC FIRM TO CALIFORNIA—Sightmaster of California Co., new subsidiary of Sightmaster Corp., New Rochelle, N. Y., is established at Gillespie Airport, Santee, a San Diego suburb. New firm is a consolidation of three electronic and metallurgical companies: Electronic Division of Thompson Products Corp., Louisville, Ky., Technical Products & Services Co., and Chemalloy Associates, developer of chemalloy metal, an invention for fluxless soldering and welding of aluminum and zinc metals or alloys.

APEX ALUMINUM—Work is started on first unit of an aluminum smelting plant for Apex Smelting Co. at Long Beach. Plant, to cost $1,000,000, will be built of structural steel, with corrugated aluminum siding and roofing.

AMMUNITION CONTRACT — Hall-Scott Motor Division of ACF-Brill Motors Co., Berkeley, receives a contract totaling about $2,000,000 from U. S. Army Ordnance for manufacture of ammunition. Production of this ammunition will

JONES and LAUGHLIN

PLASTEEL—Chosen for part of New Otis Works buildings which house J&L'S new open hearth furnaces and will help increase production in Cleveland by 200,000 net tons annually.



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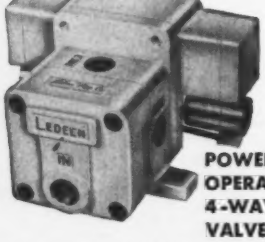

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require approximately $750,000 worth of new metalworking equipment, and company is constructing a new plant at Richmond to house this equipment. Plant is on a two-acre plot and will have 40,000 sq. ft. of productive capacity.

NEW CARS FOR SP—Southern Pacific Railroad asks for bids on 2,000 new freight cars, even though 6,300 cars ordered by this firm are still undelivered. These orders will raise to approximately 40,000 the number of new freight cars acquired or ordered by Southern Pacific since end of World War II. Since that time capacity of firm's freight car fleet has been increased by around 31%. New orders will increase railroad's appropriations for postwar equipment to about $440,000,000.

LOCKHEED AND THE AIR FORCE—U. S. Air Force cancels 35% of its contracts for the Lockheed F-94C Starfire, described as the most powerful single engine airplane, and first Air Force fighting plane to have all rocket armament. According to Air Force spokesmen, decision to reduce number of Starfires is based on availability of more advanced all-weather interceptors in numbers sufficient to meet planned requirements. Lockheed Aircraft Corp. is now building a reconnaissance version of the Constellation airliner, the RC-121, for the Air Force.

MORE TITANIUM RESEARCH FOR RYAN — Ryan Aeronautical Co. is awarded a second contract for research and development of titanium in application to aircraft production. New contract involves research concerning optimum application to aircraft structures of titanium and titanium alloys as compared with aluminum alloys and stainless steel.

NEW PLANT FOR BINNS—Binns Machine & Tool Works, Inc., San Francisco, leases 22,500 sq. ft. factory from Land Development & Investment Co. in Redwood City. When construction is completed firm will move from its present location in San Francisco and consolidate its production work at new factory.

CHUG-A-LUG—Wieland Brewery, San Jose, owned by Pacific Brewing & Malting Co., is sold to Falstaff Brewing Corp., St. Louis, Mo. Plant has annual capacity of 260,000 barrels of beer.

PIPE PLANT PREDICTION—Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y. manufacturer of non-metallic pipe and electrical conduit, takes option on a 20-acre site at Newark, owned by Southern Pacific Railway, for construction of a $2,500,000 plant. Factory will total 85,000 sq. ft., and have initial labor force of 100.

EASTMAN BUILDS IN PALY—Eastman Kodak Co. plans construction of a processing laboratory in Palo Alto, on a site leased from Stanford University, two miles from campus.

MORE ROCKET ROOM—North American Aviation, Inc., leases a 134,000 sq. ft. building near its Downey plant to provide more adequate facilities for work on design, development and manufacture of rocket engines. Engineering employment there is expected to reach 4,000 within a year.

COLORADO

BUREAU OF STANDARDS BUILDS—National Bureau of Standards begins construction of a major laboratory at Boulder which will house Bureau's Central Radio Propagation Laboratory on a 210-acre site near University of Colorado campus. Olson Construction Co., Denver, is building the $4,500,000 reinforced concrete structure. Central Radio Propagation Laboratory is engaged in a broad program of basic and applied research in radio physics and associated geophysical phenomena of the upper atmosphere and the troposphere.

FELDSPAR PLANT SOLD — Parkdale plant of Consolidated Feldspar Co., near Canon City, is sold to International Chemical Co. for a reported $650,000. Sale also involves Denver plant and mineral holdings in Gunnison, Teller, Saguache and Douglas counties belonging to Feldspar.

DENVER COAL INDUSTRY — Westvaco Division of Food Machinery and Chemical Co. leases an area of coal lands in Routt County, north of Mount Harris, and has completed an agreement to take 70,000 tons of coal a year for shipment to Pocatello, Idaho, to be used in phosphorous chemical plant there. Move is expected to open way for chemical plants in this state.

FLOUR MILL FIRE—Hungarian Branch of Denver Flour Mills was severely damaged by a recent fire in its crib elevator.

ATOMIC CONSOLIDATION — U. S. Atomic Energy Commission consolidates its uranium exploration and procurement programs on the Colorado Plateau under an operations office at Grand Junction.

MORE DRY ICE—Colorado Carbonics, Inc., subsidiary of Three States Natural Gas Co., which produces dry ice and liquid carbon dioxide, plans extensive expansion which will bring production of dry ice up to 50 tons per day.

JINGLES FOR DENVER — Mountain States Telephone & Telegraph Co. plans a $12,000,000 expansion program in Denver's metropolitan area. Program calls for expansion of dial system and addition of several new exchanges.

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IDAHO

LUMBER MILL REBUILDING—Thompson Falls Lumber Co. at Thompson Falls is rebuilding its sawmill which was severely damaged by fire in September. First construction will include a "hot pond" for winter operations, a round log gang for sawing small logs, and an edger, trimmer and sorting chain.

NEW ACID PLANT—Sullivan Co.'s new $4,500,000 acid plant at Kellogg goes into production in 1954. It is designed to eliminate sulphur dioxide fumes. It will have capacity of 100,000 tons or about 25,000,000 gal. of sulphuric acid yearly.

ATOMIC AIRCRAFT FOR ARCO — Atomic Energy Commission's Idaho Operations Office begins initial work on development of world's first atomic powered aircraft. Plans call for construction of an assembly and maintenance area and an administration area for prototype aircraft reactor ground testing facilities at National Reactor Testing Station near Arco. Work will include construction of an administrative building, assembly and maintenance buildings, service buildings, warehouse and pump house. Also to be constructed are roads, walks and parking areas, water and steam supply lines, water treatment facilities, fuel storage and alarm systems, sanitary and waste lines, and electrical communications systems.

MONTANA

BILLINGS PIPE LINE — Continental Pipe Line Co. plans construction of a 600-mile, 8-in. oil pipeline from Billings to Spokane, Wash., with an ultimate daily capacity of 25,000 barrels. Line will have outlets in Montana, Idaho and Washington. Continental Pipe Line Co. is a subsidiary of Continental Oil Co. Work will start as soon as Government approval is received.

NEW ALUMINUM TECHNIQUES — Anaconda Aluminum Co. signs agreement to use engineering techniques developed in France for making aluminum. Advantages of French method include complete control of contamination factors and mechanical improvements in operations. A new Flathead plant scheduled for construction will combine American and French methods. Plant, to be commenced in 1953, will include four 1,200 to 1,500 ft. long buildings, housing two potlines that will produce more than 50,000 tons of aluminum a year.

MIKE HORSE TO PASTURE — Mike Horse Mining & Milling Co., subsidiary of American Smelting & Refining Co., and a large producer of lead and zinc, with properties about 53 miles northwest of Helena, abandons its operations permanently due to low metal prices and a substantial exhaustion of ore reserves.

STRAWS IN THE WIND—Lethbridge and southern Alberta mining circles are studying a recently revealed plan whereby a chain of power plants would be established in southwestern Alberta to draw on low-grade coal reserves for power and electricity which would be exported to the United States Pacific Northwest power pool at Hungry Horse and Libby. Alberta's coal reserves are estimated at 47,000,000,000 tons.

NEW MEXICO

URANIUM—Around 25 tons of uranium ore are being mined daily from Laguna tribal lands leased by Anaconda Copper Co. Firm hopes to have production up to 60 tons a day within a short time. Ore is being stockpiled at Anaconda's Bluewater plant until construction of a new plant is completed.

ROCKETS DUE—U. S. Government has plans for construction of a rocket assembly building at White Sands Proving Ground. Plan calls for an explosion-proof electrical system in a building to cover 5,000 sq. ft.

NEVADA

CERTIFICATE OF NECESSITY—Defense Production Administration issues certificate of necessity for the following defense-connected industrial project: Manganese, Inc., Henderson, $2,750,000 for manganese ore at a fast write-off of 50%.

MEAT MARKET—Nevada Meat Packing Co., Inc., starts construction on a $200,000 plant near Reno to contain some 7,000 sq. ft. of floor space. Facilities will be installed for slaughter of cattle and hogs only, and plant will service all of Nevada and Northern California.

MORE STEAM—Colorado River Commission for Nevada is investigating possibilities for erecting a steam generating plant to relieve power shortages in southern Nevada's industrial area. Commission plans erection of a single unit, 30,000 kilowatt or a double, 60,000 kilowatt unit. Cost estimates range as high as $15,000,000.

RUTH MINES—Kennecott Copper Corp. plans conducting major underground copper mining operations at its Ruth properties next year. Company expects to achieve a daily production of 8,000 tons from a body of ore 900 ft. below Ruth pit. Deposit is believed to contain 22,500,000 tons of commercial grade ore. Project involves an eventual investment of over $13,000,000.

TUNGSTEN MILL — Graham Development Co. is operating a tungsten concentration mill at Spring Valley. Plant's capacity is 75 tons of ore daily.

BMI SALE—State owned Basic Magnesium plant, located at Henderson, and built by U. S. Government during World War II, is sold to Basic Management, Inc., a non-profit corporation of five major lessees. Corporation assumes administration of plant and also the unpaid balance of Nevada's debt to U. S. Government. (Original purchase price was $24,000,000.) Plant is spread over 8,500 acres and provides factory and storage space for 50 private companies.

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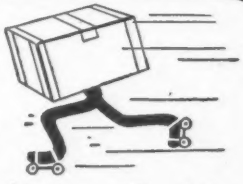

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OREGON

WAREHOUSE SPACE—Tumpane Co., Inc., U. S. Air Force contractor, completes arrangements to use 600,000 sq. ft. of floor space at Vancouver Shipyards and 500,000 sq. ft. of space in Pacific International Livestock buildings in North Portland, for storing mobile equipment. This augments 400,000 sq. ft. area now occupied at former Oregon Shipyards.

FREIGHT LINE MERGER — United Truck Lines, Inc., acquires Robertson Freight Lines for merger into its operations at its Portland terminal at 1519 N.W. Overton St. Purchase price was $121,000, and it included 156 pieces of equipment. Combined operation gives United Truck Lines 542 trucks, trailers and pickup trucks.

CORE LATHE INSTALLATION—Astoria Plywood Corp. installs a new core lathe to utilize cores of logs too small for cutting on present equipment. Machine will be used first to strip more than 339,000 ft. of log cores now in storage.

NAME CHANGE — Multnomah Iron Works, Portland manufacturer of irrigation equipment, changes name to Wade Manufacturing Co. It is a division of R. M. Wade & Co.

SPARKLING SALE—Canada Dry, Inc. bottling plant at 4370 N.E. Halsey St., Portland, is sold to Sperry & Hutchinson Co. for an administrative and warehousing headquarters for its S & H Green Stamp business. Purchase price was about $500,000.

PLYWOOD PURCHASE—U. S. Plywood Corp. acquires full ownership of Siuslaw Forest Products, Inc., Mapleton, which gives purchaser 286,000,000 board ft. of timber, bringing its total to 2,500,000,000 board ft. Earlier this year U. S. Plywood acquired 100% ownership in Kosmos Timber Co. in Washington and added 913,000,000 ft. of timber to its holdings.

RUBBER PLANT—W. J. Voit Rubber Corp., Los Angeles, opens new plant in Portland for manufacture of camelback and other tire repair materials. Plant is housed in a 16,000 sq. ft. building located on a three-acre site with more than $300,000 worth of machinery installed and 40 persons permanently employed.

ALUMINUM FOR THE DALLES—Harvey Machine Co., Torrance, Calif., plans to build a $45,000,000 aluminum reduction plant near The Dalles, if approval is granted by Defense Production Administration. Plant will have an annual capacity of 54,000 tons of aluminum.

MACHINERY CO. TO OREGON—Bird Machinery Co., manufacturer of equipment for paper, chemical and other processing industries, establishes Pacific Coast offices at Portland on sixth floor of Portland Trust Bldg. Firm is a sales offshoot of Bird & Son, Inc., which has paper and roofing plants in Massachusetts, Rhode Island, Louisiana and Illinois.

HANDLE STORY—Oregon Handle Co. purchases Winlock Handle Co., Springfield. Firm manufactures raw handles which are shipped to St. Helens Wood Products at St. Helens for drying and grading. Production is 20,000 handles daily.

SPUD NEWS—Oregon Frozen Foods Co. expects to begin processing potatoes at its Ontario plant about mid-January. This will provide a year around payroll for some 1,000 employees. As many as 100 carloads of potatoes will be purchased monthly.

UTAH

WESTERN MACHINERY BUILDING—Western Machinery Co. dedicates a new 23,000 sq. ft. building at 2300 S. Main St., Salt Lake City, designed to house Salt Lake City branch operations, warehouse, offices and shop for repair and maintenance. Fifty persons are employed there. Firm distributes industrial, construction, mining and agricultural equipment.

PROVO POWER PLANT—Provo River Water Users Association votes to construct its own power plant at Deer Creek reservoir project in Provo Canyon, south of Salt Lake Valley. By this action the Association rejects a Bureau of Reclamation proposal to build the plant, but does not rule out a Utah Power and Light Co. offer to build plant with its own funds. A previous proposal of the Association to build the 5,000-kilowatt plant was turned down by the Department of the Interior.

TOOELE SMELTER CLOSED—International Smelting & Refining Co. will close its lead-zinc smelter at Tooele for a three or four months period so that enough ore can be stockpiled to warrant reopening.

TANK FIRM PURCHASE—Hammond Iron Works, Warren, Pa., purchases Keyes Tank Co. plants at Provo and Casper, Wyo. Local management of Keyes firm will remain unchanged. Production of tanks and large pipe products for oil industry, similar to those manufactured by Hammond, will be continued there.

STEEL PLAN — General American Transportation Corp. plans construction of a $500,000 steel fabricating plant near Geneva Steel Co. mills, pending rezoning of that area for industrial use. Proposed plant would be used for plating and welding storage tanks used in petroleum industry and other fields.

FURNITURE FACTORY FIRE—Better Built Furniture Co.'s unfinished factory in the Kearns industrial area, was recently destroyed by fire. Damage is estimated at about $10,000.

CRACKING PLANT IN USE—Phillips Petroleum Co. places its new $10,000,000 catalytic cracking plant "on stream" at Woods Cross. This plant increases run of crude oil from 4,500 to 10,000 barrels a day.

GROWING SALT — Deseret Livestock Co. begins production at its new $500,-

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000 solar evaporation salt plant at Great Salt Lake. Plant includes concentration and harvesting ponds, collection and drying facilities and transportation equipment. An additional $1,000,000 will be invested in this project if a satisfactory royalty agreement can be made with Utah State Land Board.

WASHINGTON

BUILDING FOR WEYERHAEUSER — Weyerhaeuser Timber Co. plans construction of a new forestry building on a 21,000 sq. ft. lot in Centralia.

OXYGEN EXPANSION—Western Oxygen, Inc., Seattle producer of oxygen, acetylene, medical and other gases, expands productive capacity by a new plant at 2447 Sixth Ave. S.

HANFORD BUSINESS—Atomic Energy Commission accepts low bid of $355,000, submitted by L. H. Hoffman, Portland, for completion of interior of mechanical development building in a new laboratory area inside Hanford barricades.

NORTHWEST OIL REFINERY—General Petroleum Corp., Pacific Coast affiliate of Socony-Vacuum Oil Co., commences construction of a 35,000 barrel oil refinery on Puget Sound, near Ferndale. Plant, to cost $35,000,000, will be first modern full-scale oil refinery in Pacific Northwest, and will utilize crude oil brought by pipe line from Alberta, Canada, oil fields. Crude oil to be used will be delivered through the 711-mile Edmonton-Vancouver 24-in. pipe line now being built by Trans Mountain Oil Pipe Line Co. of Vancouver. A special 40-mile extension to cost $2,750,000, will be built by that company to the General Petroleum refinery. Plans call for a "primary" distillation unit and four "secondary" processing units, a thermfor catalytic cracker, a thermal gasoline reformer, a thermal cracker, and a catalytic polymerization unit. Storage capacity will be 2,000,000 barrels of crude oil and products. Products of refinery will be distributed to all Northwest communities now served by company's Torrance, Calif., plant. About 16,300 barrels of gasoline, some 10,000 barrels of diesel and stove oils, and 6,200 barrels of fuel oil will be produced daily.

STAR MACHINERY — Star Machinery Co. is rapidly completing new $810,000 plant at 241 Lander St., Seattle. Structure will include a two-story office building, a two-story warehouse, and a one-story display area and shop.

ALCOA EXPANSION AT VANCOUVER—As part of an expansion program revealed several months ago, Aluminum Co. of America starts construction of a new ingot casting building. Structure will contain 42,000 sq. ft. of floor space, and total investment, including equipment, will be about $1,217,500. Extrusion, sheet and several other types of fabricating ingots will be produced in new facilities.

HANGARS ON—Western Air Lines, Inc., starts construction of a $250,000 hangar at Seattle-Tacoma International Airport. Steel and concrete structure will have 16,875 sq. ft. of floor space and will house maintenance shops, service areas, storage departments and an automotive section.

FIBREBOARD EXPANSION—Fibreboard Products, Inc., completes part of a long-range expansion program at its Port Angeles and Sumner plants. Above is aerial view of Port Angeles Division. New equipment has been added and machines have been modernized. Improvements at these two plants will eventually increase output by about 300%.

POWDER PLANT—Pacific Powder Co. operates new plant at Tenino and is utilizing civic center building for this purpose. Between 30 and 40 persons are employed there.

FEDERAL CONTRACTS FOR SPOKE—Power City Electric Co., Spokane, receives a $203,605 Federal contract for construction of electrical distribution systems to camp areas at Camp Hanford. General Machinery Co., also of Spokane, is awarded $94,000 contract for fishway gantry cranes for McNary Dam.

DAILY BREAD — Langendorf United Bakeries, Inc., purchases site at S. 38th and State Streets, Tacoma, for construction of a plant. Structure will include offices.

MACHINERY FIRM CONSOLIDATION—Melcher-Ray Machinery Co., Walla Walla, purchases property at South 9th St., and will build a modern plant, enabling firm to consolidate all operations in one location. Building will be 120 x 140 ft., and will house shops and departments for machinery work, showroom, parts department and offices.

STEEL MILL OPENS — Sierra Drawn Steel Corp., Los Angeles, opens new steel mill at Seattle. Plant will produce cold drawn bars for sale to jobbers.

MORE ICE—American Ice & Cold Storage Co., 2815 Federal Avenue, Everett, plans to build a $275,000, two-story warehouse addition on its property there.

INDUSTRIAL SITES SOUGHT—Newly established Walla Walla County Port District makes formal application to Army Engineers for industrial sites near Wallula, Attalia and Burban areas. Property already designated as industrial area, would be used by private companies seeking location or expansion property.

TV FOR SPOKANE—Soon to be constructed is a microwave radio relay system between Spokane and Yakima to bring network television programs to Spokane. National Broadcasting Co. has placed an order for construction of these facilities which are expected to cost around $3,000,000. When system is completed, network programs will be transmitted from Seattle to Yakima by coaxial cable and over relay system to Spokane.

BOEING EXPANSION — Boeing Airplane Co. is building a new $213,000 annealing furnace at plant No. 2, Seattle, to treat large fabricated jigs and gauges for B-52 bomber tooling program. Furnace will accommodate pieces or assemblies up to 40 x 12 x 12 ft.

WYOMING

WYOMING GAS FOR NORTHWEST—Pacific Northwest Pipeline Corp., Houston, Tex., which has conditional contracts with Pacific Northwest firms to bring gas from Four Corners area adds 95,000 acres of gas-producing land in southwestern Wyoming to its sources of supply. Newly acquired land is 450 miles nearer to Pacific Northwest markets, and brings company's total reserves to 3,500,000,000,000 cu. ft. of gas.

GAS ACQUISITION — Mountain Fuel Supply Co. acquires purchase rights for gas developed in Dry Piney-LaBarge area of Sublette County. Firm obtained options on this gas after a well being drilled by the Pfaff-Quealy Co. blew out at a depth of 984 ft. Well flowed at a rate of over 70,000,000 cu. ft. of gas per day before being brought under control.

WESTERNERS AT WORK

Arizona

Phelps Dodge Corp. appoints J. E. PAPIN concentrator superintendent of its Morenci branch. He succeeds H. T. HERIVEL, named consulting metallurgist at Morenci.

California

JOHN MUCHMORE, recently personnel manager with *Hughes Aircraft Co.*, joins *AiResearch Manufacturing Co.*, Los Angeles, as staff assistant to C. W. REYNOLDS, director of public and industrial relations.

T. L. LENZEN is elected a vice president of *Standard Oil Co. of California.*

HENRY S. WADE, vice president of *Owens-Illinois Glass Co.*, is named general manager of firm's Pacific Coast division with offices in San Francisco. He succeeds C. G. BENSINGER, transferred to Toledo.

Pacific Bedding Co., Los Angeles, promotes A. JOHN SPARROWK to position of treasurer and EDWARD L. COREKIN to secretary. Both are named members of firm's board of directors.

CHARLES W. HUSE, *United States Steel's* director of public relations, Western district, San Francisco, is appointed administrative assistant, office of assistant to chairman, New York. HARRY J. WILLIAMS becomes acting director of public relations at San Francisco.

HAROLD C. OLSON is named works metallurgist for the Los Angeles plant of *Lindberg Steel Treating Co.*

H. C. Olson *H. E. Buecken*

HANS E. BUECKEN joins *Extruders, Inc.*, Hawthorne, Calif., as plant manager and product development engineer.

E. M. SLONAKER is elected executive vice president of *Willard Storage Battery Co.* of Calif. He succeeds CHESTER H. STARR, who is retiring.

J. HOWARD BATCHELOR is appointed to post of general manager for *Liberty Manufacturing Co.* of Santa Monica, specialist in fabrication and assembly for aircraft manufacturing plants and allied industries. EDWIN ARTHUR KRAFT, JR., becomes sales manager.

Two top civilian experts from Navy Bureau of Aeronautics and U. S. Air Force join *Ryan Aeronautical Co.'s* engineering department. G. C. DANCH will serve as executive assistant to BRUCE SMITH, Ryan's director of engineering, and will perform special assignments. A. DEVARMOND becomes chief of structures at Ryan and will also be chief of aerodynamics.

VICTOR J. POLLOCK, formerly vice president and general manager of a Grace-owned manufacturing business in Los Angeles, is appointed controller of *Consolidated Engineering Corp.* He will supervise accounting, cost accounting and office procedures for the corporation and assist its treasurer in general financial planning.

E. DALE HARMAN is appointed assistant manager of *Solar Aircraft Co.'s* quality control division in San Diego, Calif. CLYDE W. SEYMOUR, formerly manager of production control department, is named assistant manager of manufacturing division. W. ROBERT BRUCE, assistant manager of production control department, takes over Seymour's former position.

PAUL SANDERS is named assistant manager of *General Petroleum Corp.'s* Torrance, Calif., refinery. He replaces RICHARD E. LAUTERBACH, named manager of corporation's newly announced refinery to be built at Ferndale, Wash. E. G. SURBER is advanced to post of superintendent of Torrance plant.

JOHN K. NORTHROP, president of *Northrop Aircraft, Inc.*, Hawthorne, Calif., retires from aeronautical field. Board chairman, OLIVER P. ECHOLS, is elected to serve as firm's president.

RALPH W. ROTHHAAS is made credit manager of *Trailmobile Inc.'s* Pacific Coast division. His headquarters will be in Berkeley, Calif.

G. H. DEKKER, formerly tax auditor for State of California, becomes controller of *National Welding Equipment Co.* He succeeds E. R. RUSSELL, who is retiring.

Pacific Airmotive Corp., Burbank, names ANTHONY J. KREINER as manager of its manufacturing division.

HARRY E. MESCHER is named works manager for Electrical Furnace division of *Pacific Scientific Co.* in Los Angeles. His background with this firm is that of sales and consulting electrical engineer.

Dalmo Victor, San Carlos, Calif., lists following new appointments: JAMES SHAW, superintendent of assembly in manufacturing division; RALPH BENNINGER, RF Lab. administrative engineer in engineering department.

JOHN BERKSON is named president of *Alsynite Co. of America*, manufacturer of translucent plastic building panels with plant in San Diego, succeeding LOUIS POTOMAC.

TOM CRAIG becomes new personnel manager at Belmont plant of *Western Gear Works.*

JOHN A. KNAUFT, formerly with *California Manufacturers Association*, is named governmental relations counsel for *California Motor Transport Associations, Inc.*

G. H. HEMMEN becomes chief engineer at *Union Oil Co. of California's* research and process department, Brea, Calif. He succeeds HOMER REED, recently elected president of *Brea Chemicals, Inc.*, new wholly owned Union Oil subsidiary for development, manufacture and marketing of chemicals from petroleum. H. C. MEINERS, formerly assistant manager of Union's Oleum refinery, replaces Hemmen as manager, and M. S. THOMPSON is appointed general superintendent of operations.

ALBERT J. DORAN is named chief of accounts payable and accounts receivable for *Bethlehem Pacific Coast Steel Corp.*, San Francisco. He succeeds M. J. O'BRIEN, deceased.

HAROLD H. KEAYS is appointed manager of *Lincoln-Mercury* division's Maywood, Calif., assembly plant. He replaces E. J. BOND, now manager of firm's plant in Metuchen, New Jersey. J. E. ACKER, formerly manufacturing planning manager for Lincoln-Mercury in Detroit, becomes Keays' assistant; S. F. MCKENNA is new industrial relations manager; and ERVIN J. WILLERT, plant controller.

Beckman Instruments, Inc., South Pasadena, Calif., appoints JOHN BISHOP, formerly head of firm's special products division, assistant general manager of the instrument division.

American Potash & Chemical Corp. appoints PARKER S. DUNN as vice president-production. He will be in charge of production and engineering at firm's plant at Trona, Calif., succeeding RUSSELL W. MUMFORD, who transfers to company's Los Angeles office as consulting engineer.

MYRON M. HEMMERDINGER is appointed Director of Material at *Inet, Inc.*, Los Angeles electrical manufacturing firm.

Colorado

R. E. METZGER of Denver is newly appointed manager of tubular sales at *Colorado Fuel and Iron Corp.* This is a step towards operation of a seamless tube mill scheduled to start production at Pueblo early in fall of 1953.

LACY L. WILKINSON is appointed regional director of *Small Defense Plants Admin-*

istration for Colorado, Utah, Wyoming and New Mexico. He formerly was Colorado director of *Office of Price Stabilization.*

ROBERT SAYRE joins *Climax Uranium Co.*, Grand Junction, as mining engineer.

J. R. Simplot Co.'s new chief of Colorado uranium division is LOUIS P. GAGGINI. His headquarters will be in Grand Junction. He was formerly employed by *Dulaney Mining Co.*

Idaho

ROBERT VAN HORNE is made manager of *Amalgamated Sugar Co.'s* Nampa, Idaho, plant. He succeeds EARL Q. MARSING, deceased.

JOSEPH E. CUSHMAN, division manager for *Utah Power and Light Co.* at Preston, Idaho, is appointed assistant to R. H. ASHWORTH, vice president. Cushman's headquarters will be in Salt Lake City. Succeeding him as division manager will be J. NEWELL STEPHENS, Preston division sales manager.

Montana

Anaconda Copper Mining Co. makes following promotions within ranks: ARTHUR C. BIGLEY, manager of mines, becomes general manager of Western mining operations to replace CHESTER H. STEELE, now vice president in charge of Western operations for the company; EDWARD I. RENOUARD, general superintendent of mines, is promoted to manager of mines, and A. R. SIMS, assistant general superintendent of mines, takes over his position; EDWARD BONNER, JR., mine superintendent, becomes assistant general

E. I. Renouard *A. C. Bigley*

superintendent of mines; and JOSEPH CANAVAN, assistant mine foreman, becomes mine foreman at Belmont mine. In Great Falls Reduction department of Anaconda Copper Mining Co.: THOMAS K. GRAHAM becomes assistant general superintendent, and GUY T. WEVER succeeds him as superintendent of electrolytic zinc plant; CLARENCE V. SAYLOR becomes assistant superintendent of copper refineries, and CHARLES R. HILL is named acting assistant mechanical superintendent.

New appointments at *Anaconda Aluminum Co.'s* reduction works at Columbia Falls are as follows: HOWARD G. SATTERTHWAITE will be manager; JAMES E. SMITH, production superintendent; CARL J. LUNDBORG, chief engineer. They all transfer from Great Falls Reduction department of *Anaconda Copper Mining Co.* at Great Falls.

Nevada

C. A. OLSEN, assistant manager of *Clover Valley Lumber Co.*, Loyalton, is named firm's

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DALLAS LUFKIN, TEXAS NEW YORK

resident manager. He succeeds JOEL S. CONKLIN, retired.

R. V. THOMPSON, formerly mill superintendent at *Utah's Metal Producers*, becomes metallurgist at *Manganese, Inc.*, Henderson.

Oregon

Hyster Co. promotes two engineers: GLEN HERZ becomes company's assistant chief engineer; ROBERT BROWN takes over Herz's former position as supervisor of testing and proving ground.

R. Brown

G. Herz

PHIMISTER PROCTOR, managing director of *Oregon Forest Products Laboratory* at Corvallis, returns after 18 months as an Air Force colonel in procurement division.

EDWIN T. CLAPPERTON, research chemist at *Western Pine Association Laboratory* in Portland, joins staff of *Coos Bay Lumber Co.* to work on refinement of hardboard. He was responsible for discovering a method of extracting arabogalactan from larch.

Utah

Newly appointed assistant general manager of *Kennecott Copper Corp.'s* Western mining division is J. PARNELL CAULFIELD. His former position of general manager of Kennecott's Utah Copper division will be filled by L. F. PETT, general supervisor of operations for division. FRANK R. MILLIKEN joins corporation as vice president. He will supervise its mining operations in United States and Chili.

Pioche Manganese Co., affiliate of *Combined Metals Reduction Co.*, makes following staff appointments with resultant changes in Combined Metals organization: MAX J. KENNARD becomes general manager of Pioche and is succeeded as chief engineer of all operations at Combined Metals by K. K. HOOD; R. W. LOTTRIDGE is named manager of plant at Henderson; F. R. LEONARD is now metallurgical assistant to general manager of Pioche Manganese. Other Pioche Manganese appointments for Henderson plant are: F. B. PETERMAN, assistant plant manager; J. T. CRAWFORD, office manager; FRANK P. SOUDERS, plant superintendent; L. J. HARTZELL, chief chemist; and RAY E. KIRK, master mechanic.

Washington

KJELL STORDALEN, active in wartime in Norwegian underground, and later varsity ski-jumper at University of Washington, becomes superintendent for *Anacortes Veneer, Inc.*

JEAN R. OKEL becomes Western division engineer for *Monsanto Chemical Co.* His headquarters are in Seattle. He succeeds W. S. MONRO, appointed plant manager for firm's Seattle operation.

C. WYNNE WILSON joins staff of *Seattle Chamber of Commerce* as manager of research division in industrial department.

ASSOCIATIONS ELECT

WM. E. BUTTS, president of *General Metals Corp.*, San Francisco, is new vice president of *Diesel Engine Manufacturers Association.*

W. H. H. CRANMER, president of *Oil Inc.*, *New Park Mining Co.*, and *East Utah Mining Co.*, and N. G. MORGAN, JR., both of Salt Lake City, are newly elected directors of *Independent Petroleum Association of America.*

Newly elected officers of the *Intermountain Association of Petroleum Geologists* are as follows: President, LEWIS F. WELLS of *Sun Oil Co.;* vice president, ERNEST TISDALE of *Cities Service Oil Co.;* secretary, W. F. HEINEY of *Continental Oil Co.;* and treasurer, STANLEY COLLINS of *Standolind Oil and Gas Co.*

W. P. MORRIS, resident manager of potash division of *Duval Sulphur & Potash Co.*, is elected president of *New Mexico Mining Association.* New first vice president is CARL S. ELAYER of Silver City, and second vice president is A. J. THOMPSON of Socorro, head of department of Mining and Metallurgy, *New Mexico Institute of Mining and Technology.*

California Manufacturers Association: President, ROBERT K. CUTTER, M. D., president, *Cutter Laboratories;* vice president, R. A. LIVINGSTON, president, *Tubing Seal Cap, Inc.;* treasurer, RALPH HOFFMAN, president, *Link-Belt Co., Pacific Division.*

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News about those who distribute and sell industrial equipment and materials

The *Lisle & Leif Co.*, Western distributors for *Aro Equipment Corp.*, pneumatic tool division, and *Security Lock Nut Corp.*, moves to new quarters at 3141 So. Grand Ave., Los Angeles 7, Calif.

ARTHUR F. TUDURY, president of *Refrigerating and Power Specialties Co.* of San Francisco is named president and general manager of two newly formed East Coast engineering equipment firms: *Evis-Southeast Co.* in Atlanta, and *Evis-Mideast Co.* in Philadelphia. All three firms distribute a new catalytic device which is a non-chemical method of coping with boiler, pipe and cooling system scale.

H. M. KIRKBY is appointed sales promotion manager of *Clayton Mfg. Co.'s* Steam Generator division. His headquarters will be at Clayton's Chicago branch.

ROBERT D. STOTTLEMEYER, Northwest division sales manager for *National Supply Co.*, is named assistant division manager. His headquarters will be in Casper, Wyo.

CHARLES R. LONG, Pacific Coast district lamp engineer for *Westinghouse Electric Corp.*, transfers headquarters from Los Angeles to 410 Bush St., San Francisco. EARL F. LARSON is appointed to newly created position of South Pacific district lamp engineer.

Diamond Machine Tool Co., Pico, Calif., opens its local sales office and display room for Los Angeles area at 2816 S. Santa Fe Ave., Los Angeles.

Minneapolis-Honeywell Regulator Co. moves its district sales office from 1319 21st St. to larger quarters at 1924 28th St., Sacramento. This office handles firm's automatic controls for area bounded by Solano, San Joaquin, Calaveras, and Mono counties to south; Yolo, Colusa, Glenn, Trinity and Siskiyou on west and northwest, and to Oregon border on the north. Territory also includes eleven counties in western Nevada. FRED B. AKERSON is appointed industrial manager of *Minneapolis-Honeywell Regulator Co.'s* Portland regional office. He succeeds LESTER W. WILLIAMS, who is transferred to the East.

Frank A. Emmet Co., 2837 W. Pico Blvd., Los Angeles 6, is reactivated as a manufacturers' agent for electronic, radio and allied fields and checks off four new factory accounts for representation in California, Arizona and New Mexico. These are *Skottie Electronics*, Peckville, Pa., maker of ceramic capacitators; *Ferranti Electric, Inc.*, New York City, manufacturer of transformers, 7-range clip-on volt-ammeters and electrostatic volt meters; and *Spot Tools, Inc.*, Morris Plains, N. J., maker of flash-lighted tools for television and radio repair work. Frank A. Emmet Co. is also appointed district sales manager for *Campbell Industries, Inc.*, Chattanooga, Tenn., manufacturer of deposited carbon precision resistors.

RICHARD H. GANNON is made manager of *Kaiser Aluminum & Chemical Sales, Inc.'s* Los Angeles district sales office which serves manufacturing industries of Southern California and Arizona.

R. H. Gannon *B. Waters*

Kelite Products, Inc., Los Angeles, manufacturer of industrial cleaning chemicals, promotes BURTON WATERS to position of regional sales manager. He will be active in Southern California area.

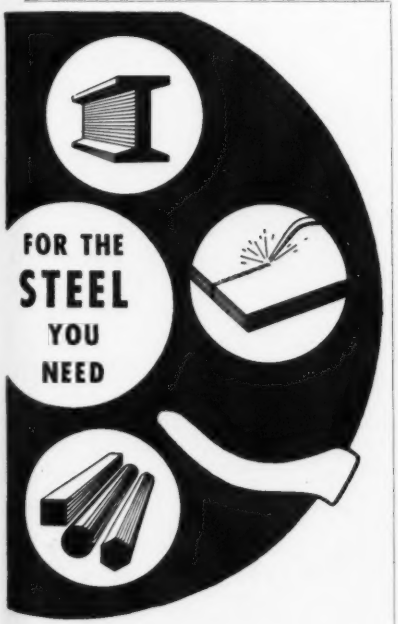
Reorganization of *Pacific Airmotive Corp.'s* sales division on a decentralized plan involves following changes: GEORGE T. KELLER is appointed sales manager, engine division, Burbank; ROY BACKMAN, sales manager, products dept.; and ERNEST L. BLACK, sales manager, manufacturing division. A new sales department is being established for aircraft divisions. GEORGE F. SHAVER is newly appointed sales manager for Pacific Airmotive Corp.'s Seattle branch. Succeeding him as merchandise sales manager at firm's headquarters in Burbank, Calif., is J. M. CRAIG, formerly sales manager for *Pacific Equipment Co.* in Los Angeles.

F. Sawyer *J. Gill*

With retirement of FRANK SAWYER, White trucks and equipment will be distributed in Long Beach area by *Joe Gill Motor Co.*

NELSON A. HOWARD, JR., moves to 900 Wilshire Blvd., Los Angeles 17, Calif. He represents: *Patent Chemicals, Inc.*, Paterson, N. J.; *Alex Corp.*, Niagara Falls, N. Y.; *Equipment Engineers, Inc.*, San Francisco; and *Oliver United Filters*, Oakland. Telephone MAdison 9-3401.

Pacific division of *American Air Filter Co., Inc.*, opens a warehouse in South San Fran-



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cisco to serve California, Washington and Oregon. JOHN HELLSTROM, for past two years manager of American Air Filter Co., Inc.'s Pacific division, is transferred to Louisville, Kentucky. C. A. PICKETT is transferred to San Francisco as manager of the Pacific division; and WILLIAM B. POLHEMUS comes to San Francisco as his assistant.

S. B. Flora *C. A. Pickett*

SAMUEL B. FLORA becomes assistant manager of sales, Los Angeles district, for *Bethlehem Pacific Coast Steel Corp.*

A Colorado corporation, *Western Industry Services, Inc.*, forms with headquarters at 518 18th St. in Denver. Organization provides procurement and engineering counsel and industrial design services. It will also act as coordinator for manufacturers seeking new business and those wishing to place subcontracts.

A district office, located in Salt Lake City, Utah, to service all of Utah and southern Idaho, is opened by *National Electric Products Corp.*, Pittsburgh, with JOHN LONGDEN, for the past nine years district manager for *Westinghouse Electric Supply Co.* in Salt Lake City, as new district manager. He will report to National Electric's Western regional manager, R. G. HOLABIRD, whose headquarters are located at 400 Potrero Ave., San Francisco.

Raybestos-Manhattan, Inc., Passaic, N. J., opens its new Denver, Colorado, warehouse at 4500 York St. It will serve Rocky Mountain region with industrial rubber products and packings, as well as Rocky Mountain and Western Canadian oil fields with hose, belting, packing and friction materials. ELTON T. FAIR, JR., sales representative for this territory, is in charge of warehouse.

Bearings & Transmission Products of Eureka, Calif., is appointed stocking distributor of reusable hose fittings, hose and self-sealing couplings for *Aero-Coupling Corp., a subsidiary of Aeroquip Corp.*, Burbank, Calif. Distributing firm, managed by J. H. JACOBS, will stock Aeroquip's complete industrial line.

George C. Brandt, Inc., is new sales agent for *Archer-Daniels-Midland Co.* in Denver and state of Colorado. Firm will handle all ADM drying oils, fatty acids, paint specialties and linseed oil in this area. Prior to January 1, when Brandt plans to open a Denver sales office and warehouse in Denver, accounts will be served from office and warehouse located at 1401 Trafficway, Kansas City, Missouri.

L. H. Butcher Co., recently acquired subsidiary of *Udylite Corp.*, appoints JACK RASKIN as West Coast manager for its metal finishing division. EARL ARNOLD is appointed his assistant, and BILL LIDTKE is outside

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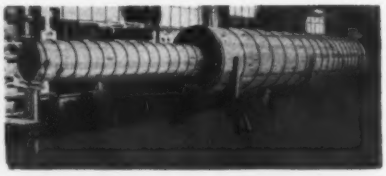

Technically, the degasifier is not a tank, but the problems are similar; the machinery needed is the same. It demonstrates the great versatility of the Windeler staff with experience plus.

Whether your need is for standard oval, round, or rectangular, or a special design, Windeler has the skill, men, and machinery to handle it. Redwood, oak, Douglas Fir . . . whatever your specifications indicate, you can rely on Windeler when your problem is wood.

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service representative in Los Angeles area. NORMAN DIEBALL is in charge of manufacturing and assembly of electrical equipment and other equipment used by metal finishing industry. DAVE ALTHOUSE becomes a sales engineer for Butcher Co., and he is replaced at plating order desk by WARREN BLAZER. In

J. Raskin *B. J. Sherwood*

firm's San Francisco office, DICK COEN is transferred from chemical department to be in charge of San Francisco metal finishing department. FLOYD BROWNING is now a sales engineer. In firm's Portland office, KENNETH HUMPHRIES, formerly of chemical division, is now a sales engineer in metal finishing department. In support of its recent establishment as exclusive West Coast distributor and manufacturer for *Enthone, Inc.*, L. H. Butcher Co. appoints BERT J. SHERWOOD to position of technical representative, specializing in Enthone products. With headquarters in Los Angeles, he will be available in eleven Western states served by other L. H. Butcher offices.

Coast Service & Converting, Los Angeles, moves its plant and offices to larger quarters at 1300 Santa Fe Ave., Los Angeles 21.

Marsh Steel Corp. opens its new $500,000 Denver warehouse at 5500 Colorado Blvd. Building contains 36,000 sq. ft. of floor space and includes an office facing Colorado Blvd. from which firm will transact its business in seven Rocky Mountain Empire states including Wyoming, Colorado, New Mexico and southern Montana.

Corona Oil Specialties & Service Co., of La Canada, Calif., appoints ROLAND E. SMITH, 617 S. Olive St., Los Angeles, to handle export sales of Cosasco Scotch Nipples. He will represent this line for export to all countries outside the United States.

Russell, Burdsall & Ward moves its Northern California sales office to 112 Market St., San Francisco. Sales continue under the direction of JOHN BOYD, assisted by ROBERT BOAZ.

HERBERT J. WATT becomes assistant vice president—sales, Western area, *United States Steel Co.* He will serve as representative for vice president—sales in the West; headquarters are in Chicago.

Air Reduction Pacific Co., division of Air Reduction Co., Inc., opens a new branch in San Diego at 1531 Rigel St. Division's complete line includes acetylene, oxygen, nitrogen, torches, regulators, cutting machines and gas welding accessories, plus electrodes, arc-welding machines and accessories.

M. A. RAMPY, *Fruehauf Trailer Co.'s* Arizona branch sales representative, is now manager of this branch. He succeeds LEE CRAYTON, who has joined the *J. T. Jenkins Co.* of Phoenix.

RAY HOSIER joins *Ziegler Steel Service Co.*, of Los Angeles, in a sales capacity. He will cover downtown, central and east Los Angeles industrial areas.

D. B. HAYES becomes sales manager of Glacier division, *Union Oil Co.*, with headquarters in Great Falls, Mont. He succeeds GEORGE S. SMITH, transferred to firm's Los Angeles office as manager of sales services.

The O'Toole Dodridge Co. of Gardena, Calif., will be representative in California for *Sub-Zero Products*, Cincinnati 29, Ohio, manufacturer of low temperature industrial chilling machines.

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